1937

Mammals of Maine

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MAMMALS OF MAINE

A thesis submitted in partial fulfillment of
the requirements for Major Honors in Zoology

BY

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INTRODUCTION

The title of this paper is a misnomer. A piece of work which does not encompass all the literature concerning Maine mammals cannot well be called "Mammals of Maine." The present author (or compiler) has had very little field experience with mammals; he has not had access to a good collection of skins from Maine; the present compilation, therefore, is nothing more or less than a library exercise. The compiler might not recognize some of the forms listed if he saw them in the laboratory, to say nothing of in the field.

Purpose

The present paper was undertaken in order that the compiler might gain a slight knowledge of Maine mammals and the literature pertaining to this branch of zoology. It was undertaken as a "major honors" course at the University of Maine for the school year of 1936-1937. It is possible that a perusal of this paper will reveal to others the striking scarcity of information on many of our mammalian forms.

Scope

All the endemic forms known to have occurred in Maine within historic times are listed. Some of these forms are extirpated at the present time. Introduced species are not treated.

Contents

Keys. The distinctions between races, or even species, of mammals are sometimes so small that keys may not even be practicable in the laboratory. Positive identification in the field sometimes is work for an expert. Yet the writer, in presenting these keys, has given "field" characters whenever possible. The "field" characters precede the "laboratory" characters in all cases, so a familiarity with the keys should give the reader, first, a knowledge of the external differences by which he might distinguish the animal without too close study and, second, more exact characters which should usually serve to positively identify at least the majority of adult mammal specimens taken within our boundaries.

As a "field" key is what is intended primarily, the Cetaceans are excluded. The reader is referred to the outline drawings in Anthony (1928) of whales, dolphins, porpoises, etc., which are better by far than key descriptions.

For identification even to species, bats must be treated as "birds in the hand," so the key to the Chiroptera really consists entirely of laboratory characters.

Since there are only three ungulates which have occurred within our boundaries, the moose, Virginia deer, and woodland caribou, a key to this order is omitted.

Although they are introduced forms, Rattus and Mus are included in the key to rodents, but no further space is devoted to them. They sometimes occur in the wild and might, by a far stretch of the imagination, be confused with some of our endemic forms.

Main body

The "general descriptions" have been drawn from a variety of sources. They are very specific, rather than general, in the majority of cases.

Taxonomy is discussed under this heading. Where possible, the scientific names have been brought up to date, so the reader is warned that the names which he will here meet have synonyms of long standing, in some cases, in the literature on mammalogy.

The writer has tried to be accurate on the data on "range in Maine." It is somewhat to be regretted that very little data regarding which forms occur on the various islands along our coast is available.

A few forms which may have, or are thought to have, occurred in Maine are not included in the main body but are referred to in the bibliography. Regarding the walrus, see G. M. Allen, 1930, and A. H. Norton, 1930; for the polar bear, see Norton, 1930; for the "buffalo", see G. M. Allen, 1920. These items are merely presented here as a matter of interest.

Under "life history" the compiler has drawn from many sources. Even when lengthy and detailed accounts have been available, more popular accounts have been used, for frecuently the latter present much data in a compact and condensed form. The reader may refer to the references cited for each mammal and in almost all cases, he will find a great deal of valuable data which, for the sake of making this paper brief, could not be quoted.

Under the heading of "economic status" the writer has frecuently presented a one-sided picture. The relations of the mammals to man has been stressed more than the interrelations between them and other forms of nature. This method of treatment is partly justified by the fact that very little work on

the economic status and interrelationships of mammals in Maine, even including some of our "game" animals and fur-bearers, has been done.

Bibliography

The bibliography contains many general references. The compiler has not had the time nor inclination to search out and list all the items pertaining to mammals within our borders.

With a very few exceptions, all the papers listed have been referred to in the main body of the work, but a few additional ones have been included to give the bibliography a slightly wider scope and to enable the reader to do some additional reading if he so desires.

Not all the titles listed are in the University of Maine library.

Many desirable titles have been omitted because they were not available at Orono. It is particularly to be regretted that the volumes of Forest and Stream containing the writings of the late Manly Hardy, of Brewer, were not accessible when this paper was being prepared.

Suggestions

There is much work on mammals that needs to be done in Maine. Very few attempts at life history studies have been undertaken within our borders. Many other phases need clarification. Data on rodent populations (and populations of other forms) is interesting and quite easily procured. Ecological studies on Maine islands, and inland also, might be undertaken to advantage. The analysis of stomach contents of many forms is a matter of deep interest and significance.

Above all, a large collection of all forms occurring within the State is needed. Series of Sciurus, Microtus, Zapus, Lepus, etc., etc., from various localities are much needed. Little is known of how much the species or races in many of our genera vary throughout Maine. The eastern and northeastern part of the State, and also most of the inland counties would be profitable areas in which the mammalogist might well exert himself.

There is another phase which ought not to be overlooked. This is the accumulation of data regarding Maine mammals in the past. Much information of value could be secured from the records of fur dealers who have operated in this State over

long periods. The diaries and journals of hunters and trappers should also prove of interest.

Acknowledgments

The assistance of Mr. Arthur H. Norton has been more than necessary. Not only has he referred the writer to a number of titles which otherwise would have been missed, but he has been kind enough to scan a large part of the first copy. His many suggestions have been embodied in this paper. Most of the common names are taken from Mr. Norton's "Mammals of Portland, And Vicinity."

The writer has freely consulted the vital statistics on Maine mammals compiled by Mr. Archer L. Grover, Deputy Commissioner of Inland Fisheries and Game. Acknowledgment is hereby made for the use of them.

Dr. J. M. Murray, under whose supervision the work was done, has offered many suggestions, particularly in regard to the keys. He has also read the entire first copy.

Mr. Gustav Swanson and Mr. C. M. Aldous have been courteous in loaning books and reprints in their possession.

Mrs. Jennie Boynton has done the typing of this manuscript. In spite of the fact that she has gone out of her way to correct many mistakes, many more remain and for these the writer alone is responsible.

Key to Orders of Maine Mammals

A1 Fore limbs wing- or fin-like.
- B1 Fore limbs wing-like. Bats.....Chiroptera (P. 24)
- B2 Fore limbs fin-like.
  - C1 Digits with claws. Seals.....Pinnipedia (P. 73)
  - C2 Digits without claws. Whales, Dolphins, etc.....Cetacea (See introd., pp.1&2)

A2 Fore limbs not wing- or fin-like.
- B1 Digits provided with hoofs. Deer, Moose, Caribou.....Artiodactyla (P.133)
- B2 Digits with nails or claws.
  - C1 Canine teeth present.
    - D1 Canine teeth conspicuous. Foxes, lynxes, etc.....Carnivora (P.35)
    - D2 Canines small. Moles and Shrews.....Insectivora (P. 6)
  - C2 Canine teeth absent.
    - D1 Incisors 2 above, 2 below. Squirrels, Mice, Porcupines, etc.....Rodentia (P.78)
    - D2 Incisors 4 above, 2 below. Rabbits and Hares.....Lagomorpha (P.124)

Key to Maine Moles and Shrews (Order Insectivora)

A1 Fore feet very large and modified for digging. Moles. (Family Talpidae)
- B1 Tail short, thick and very hairy. Brewer's Mole.....Parascalops breweri (P. 7)
- B2 Tail long; snout with a circle of fleshy projections. Star-nosed Mole..Condylura cristata (P. 8)

A2 Fore feet not so modified. Shrews. (Family Soricidae)
- B1 Tail much longer than head.
  - C1 Body 100-130 m.m. (3.8-5.1 in.); more than 3 unicuspids visible in upper jaw.
    - D1 Body slate-color; length 115 m.m. (4.5 in.); tail 45 m.m. (1.8 in.). Smoky Shrew.....Sorex fumeus umbrosus (P.14)
    - D2 Body brown above, gray beneath; length 100 m.m. (3.8 in.); tail 38 m.m. (1.5 in.). Masked Shrew..... .....Sorex cinereus cinereus (P.12)
  - C2 Body about 150 m.m. (5.8 in.); hind feet fringed with hairs. White-lipped Shrew.... .....Sorex palustris albibarbis (P.15)
  - C3 Body 85 m.m. (3.3 in.); 3 unicuspid teeth visible in the upper jaw. Hoy's Shrew..... .....Microsorex hoyi thomosoni (P.17)

Order INSECTIVORA

Family Talpidae (Moles)

Subfamily Scalopinae

Parascalops breweri (Bachman). Hairy-tailed Mole; Brewer's Mole.

General Description:

"Similar in general appearance to the eastern Mole, Scalopus aquaticus, but with hairy tail, constricted at base; snout shorter, with median longitudinal groove above, and nostrils lateral, crescentic; toes not webbed; hands as broad as long; fur soft, but coarser than in Scalopus and Scapanus.

"Color.--Sexes indistinguishable as to color.

"Upperparts varying from fuscous-black to blackish, with browner hairs on nose and tail, which may be white in old specimens; underparts paler and grayer than above, sometimes with brownish tinge on throat and underparts.

"Measurements.--Total length, males, 6 in. [153 m.m.], females, 6 in. [153 m.m.]; tail vertebrae, males, 1.2 in. [30.7 m.m.], females, 1.2 in. [30.7 m.m.]; hind foot, males,.8 in. [20.5 m.m.], females, .75 in. [19.2 m.m.]." (Anthony, 1928; 20).

Range in Maine:

As the whole of Maine lies within its range, presumably it is to be found in suitable localities throughout the state.

At Brunswick:

"Only two Brunswick records were found for Brewer's mole. One taken on the snow near the railroad track, March 18, 1896, and one brought in by a cat, April 28, 1910." (Pope, 1922:65).

At Portland:

"Common: I have found this species in both low, moist ground and on high, dry land." (Norton, 1930:13).

Dutcher does not mention having taken it in the Katahdin region.

One specimen from Lake Umbagog is mentioned by Jackson (1915:82).

Life History:

"This is a distinctly northern animal, occurring for the most part above the range of the common mole. Its habits seem to be essentially similar to those of the latter species, though, according to Prof. Baird, it constructs its burrows at a greater distance below the surface of the ground. Dr. Merriam, who found it common on the edge of the Adirondack wilderness, though not in the coniferous forests, says: 'Its habits, so far as I am aware, resemble those of its nearest relative (Scalops aquaticus), except that its mounds do not contain a chamber and surface opening, and its galleries are usually made a little deeper. Like this species, it is most common in dry meadow lands, while the star-nosed is usually found in moist and swampy places. It is not known to indulge in the little 'noonday excursions' which are characteristic of the last-named species.'" (Stone + Cram, 1904:190).

The present writer has seen numerous burrows and mounds of this mole about Brunswick in the spring. The cats frequently caught these insectivores, but would not eat them.

The writer recalls seeing many burrows in a sloping field. At the higher end of the field was a coniferous woodlot, which caused the snow to melt there later than in the open field. This drainage water would soak down through the field, after the moles had been digging in the spring, and drown these animals or drive them to the surface where they got no food. I have found them dead at this season near their burrows.

Economic Status:

This mole is a nuisance when it invades lawns, golf courses, etc., when it must be trapped or poisoned; it is probably beneficial through destruction of insects, particularly root destroying grubs.

Possibly this animal is of some value as a fur producer, but I have never heard of its being taken for this purpose in Maine. See Scheffer, 1922.

Subfamily Condylurinae

Condylura cristata (Linnaeus). Star-nosed Mole.

General Description:

"Form, in general, like that of Scalopus, the Common Mole,

but having a peculiarly developed snout which terminates in a fringe of twenty-two fleshy processes forming a wide, naked nasal disk. These processes are symmetrically arranged eleven on each side of a median line. Eyes small, but larger than in Scalopus, Scapanus, or Parascalops; legs short and weaker than in these genera; forefeet hand-like, palm as broad as long, with first four toes having three flat, triangular processes on the lower side of their outer edges; toes not webbed; tail relatively long, slender in summer, but greatly enlarged and thickened in winter, covered with coarse, black hairs; fur dense and silky, but coarser than that of Scalopus, Scapanus, and Parascalops.

"Color.--Sexes colored alike.

"Upperparts blackish-brown to blackish; underparts browner and paler than above, underside of tail sometimes noticeably lighter than upperside.

"Worn pelage paler and browner than pelage just described, with frequently a buffy or yellowish ring about wrists.

"In living animals the nasal disk is rose-colored.

"Young animals paler and browner than adults.

"Measurements.--Males, total length, 8 in. [205 m.m.]; tail vertebrae, 3.2 in. [82 m.m.]; hind foot, 1.1 in. [28.2 m.m.]." (Anthony, 1928:21-22).

Range in Maine:

Found throughout the State in suitable localities.

At Katahdin:

"Two specimens were caught in the grassy clearing of my base camp, at 500 feet, but no signs of them were observed elsewhere." (Dutcher, 1903:70).

At Brunswick:

"Though by no means abundant the star-nosed mole seems to be the commoner mole in Brunswick." (Pope, 1922:65).

At Portland:

"Rather common, though, according to specimens taken, somewhat less so than the above named species [Parascalops breweri]. The star-nosed mole seems to be more closely confined to the loose soil of low lands and woods than the hairy-tailed mole." (Norton, 1930:13).

Jackson (1915:91) lists specimens from the following Maine localities:

Eastport; Freeport; Oakland; Penobscot River, East Branch; Small Point.

Scarce at Orono.

Life History:

Hamilton (1931:345-355) has written extensively on the habits of this species in New York state. The following paragraphs are extracted from his paper.

"The star-nosed mole is diurnal as well as nocturnal. This mole not infrequently comes above ground in the winter. Merriam . . . and Wood . . . both record activities of this creature on and just under the snow. A number of muskrat trappers have told of seeing this animal on the snow in the swamps about Ithaca. They have also seen the mole swimming under the ice.

"While collecting specimens, the writer has frequently pressed in runways with his heel and noted the time of repair. Of 147 runways disturbed, 57 were repaired during the hours between 9 a.m. and 6 p.m., 29 were repaired between 6 p.m. and 8 p.m. and 61 were not repaired at all. On two occasions the burrows were repaired a few minutes after being disturbed."

"These animals are gregarious and in some measure colonial. A small area will be dotted with their subterranean runways, and a short distance away, in an apparently similar habitat, not a sign of them will be evident. On May 25, 1928, three males were taken from a minnow trap in a small but swift stream. The trap was placed in a pool, in three feet of water. It seems likely that the animals were together when caught. On January 29, 1927, Fred Stevens, of Ithaca, presented me with a male and female mole that were taken from the same minnow trap. The female was not pregnant. This may indicate a tendency for companionship or possibly an early courtship before mating." (P. 346).

"The tunnels in many instances open under water in the vicinity of a stream and not infrequently the burrows go so deep in swampy ground that the lower parts are well below the water line. In winter, the mole does not burrow as much as at other seasons but takes to the waterways. Then the runways lie close beneath the ice that border the streams and lakes . . . ." (P. 347).

"The nests are invariably composed of dead leaves, straw and dead grasses, not shredded, and taken from the nearest

available material. The nests are shaped as a depressed sphere, with only slight cover when the structure is beneath a log or fallen tree. The nests built to receive the young are slightly more elaborate and considerably larger, yet always made from the material nearest at hand. From all that have been found and recorded, it seems that the mole exhibits great care in its selection of a site, making certain that the nest is well above the high water line by placing it in some natural elevation." (Pp. 348-349).

"The observations on the food of this species are in no wise conclusive. Many writers are in accord with the statement that moles feed to a rather important extent on vegetable matter. In all the specimens of Condylura examined, not enough plant remains were found to justify the conclusion that the animal had taken them intentionally to round out its diet. To date, we must tentatively believe that this mole is strictly carnivorous." (P. 350).

"The season of reproduction for Condylura, as in other moles, is in the spring. Litters of young from central New York have been recorded from April 18th until the middle of June. The majority of young appear to be born about the end of the first week in May, but there is a wide deviation from this date. There seems to be only one litter a season." (P.351).

"There is a remarkable swelling of the tail in this species that occurs during the winter and spring months. In both sexes this appendage may at this time become enormously enlarged and somewhat flattened. This swelling, in some individuals, may commence as early as the last week of October and persist until June.

"Of thirty males examined in the flesh, taken between December 4 and June 3, nineteen had enlarged tails and eleven had normal tails. Of the nineteen, eight had moderately enlarged tails while eleven had greatly swollen tails. The largest tail measured 14 mm. in diameter through the thickest part. For comparison, the diameter of a ten cent piece is 18 mm.

"Of sixteen females that were examined during the same period twelve had enlarged tails, half of which were moderately enlarged and the rest greatly swollen. Three January specimens and a February individual had normal tails."

". . . As has been stated previously, food is rather easily secured in the winter and it does not seem likely, for this reason, that the enlargement is due to storage and that the tail acts as a reservoir. The periodic increase in size of the tail is an enigma that does not appear to be easily solved." (P. 354).

Economic Status:

Scheffer (1922:12) says, of moles in general:

"It is common knowledge that in certain situations moles become an intolerable nuisance from their habit of upridging the sod, throwing up mounds, tearing up the roots of plants, displacing bulbs, and creating general havoc in gardens, lawns and parks. In meadows and grain fields, too, the mounds are objectionable, not only by reason of the growing crops they cover, but also because of the obstruction they offer to the use of machines in mowing or harvesting. The presence of moles in some of these situations may be evidence of heavy infestation of the soil by white grubs or other insect larvae, but the case in point is only another illustration of the old saying that the remedy may be worse than the disease."

Regarding Condylura in New York state, Hamilton (loc.cit., 354) says, in part:

"By its very nature, however, the habitat in which this mole thrives keeps it from the notice of the agriculturist, and seldom if ever is a complaint heard from this source. Condylura is one of the most peculiar mammals that we can boast of in a land filled with interesting forms."

Family Soricidae (Shrews)

Subfamily Soricinae

Sorex cinereus cinereus* Kerr. Masked Shrew.

General Description:

"Size very small, except for Microsorex the smallest of North American mammals; muzzle sharp and pointed; eyes minute; ears nearly hidden in fur; body slender; hands and feet small and delicate; tail proportionately long, covered with hair; pelage soft and rather lax; color brownish above, lighter below; habit terrestrial; movements quick.

"Color.--Sexes colored alike; some seasonal change in pelage.

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* Formerly Sorex personatus personatus.

"Upperparts practically uniform sepia brown, with very faint sprinkling of lighter and darker hairs; hands and feet whitish; upperside of tail like back. Underparts grayish to buffy and passing gradually into darker color of upperparts; underside of tail yellowish white. Pelage everywhere slate-colored at base.

"In winter pelage, slightly darker and less brown than in summer.

"Immature pelage very much like that of adults.

"Measurements.--Sexes of equal size. Total length, 4 inches [102 m.m.]; tail vertebrae, 1.6 inches [41 m.m.]; hind foot, .5 inch [13 m.m.]." (Anthony, 1928:25).

Range in Maine:

Generally distributed throughout the State.

At Katahdin:

"One specimen was secured near a spring in the fir scrub on the tableland at 4500 feet." (Dutcher, 1903:71).

At Brunswick:

"This tiny shrew was taken in large numbers in various localities and next to Blarina is probably our most common shrew." (Pope, 1922:63).

At Portland:

"Commonest of the long-tailed shrews, and of general distribution throughout the section." (Norton, 1930:14).

Merriam (1895:62) mentions two specimens from South West Harbor.

Life History:

"Shrew mice are active throughout the winter, skipping about over the surface of the snow from tree to tree, poking their delicate, proboscis-like noses into crevices in the bark, and investigating the dark interiors of hollow trees at the bottoms of which they have to root about in the crumbling wood and vegetable mould for their accustomed prey.

"Underneath wood piles and logs are favourite haunts of these funny little beasts, and I believe that it is in such

places as these that they bring up their families. Both in winter and summer they appear to prefer the neighborhood of such little streams as neither freeze nor become stagnant at either season." (Stone and Cram, 1904:184).

"Their nests are small balls of dry leaves, grasses, or other soft vegetable material placed snugly under a log or in a hollow stump, burrow, or other good retreat, where they appear to have two or more litters of from six to ten young during the summer and fall." (Nelson, 1918:487).

"They do not hibernate, neither are they known to lay up a store of food, so the problem of food supply must keep them eternally vigilant under the snow." (Seton, 1909, II:1105).

Economic Status:

These little animals form a part of the food of nocturnal birds of prey and, to a lesser extent, hawks and shrikes.

In New York state Hamilton (1930:38) found the food of this shrew to be as follows:

"Sixty-two stomachs of Sorex cinereus cinereus were studied. Insects comprised three-fifths of the food, while vertebrates, centipedes, worms, molluscs, sowbugs, vegetable matter and arachnids occur in abundance in the order named. Only 2 stomachs had mammalian remains. Worms form only a very small part of the diet."

Sorex fumeus umbrosus Jackson. Northern Smoky Shrew.

General Description:

Size large; tail short; ears prominent.

"Upperparts (winter) dark gray, with some hairs whitish-tipped; underparts slightly paler; tail bicolor, above fuscous, below yellowish. Summer pelage somewhat darker and browner. Total length, 5.1 inches [131 m.m.] ; tail vertebrae, 2.1 inches [53.8 m.m.] ; hind foot, .56 inch [14.3 m.m.] ." (Anthony, 1928:28).

A brown phase of S. f. fumeus is said to occur, but whether or not it is present in umbrosus is not indicated in the available literature.

Range in Maine:

The range of this species is given by Jackson thus: "Nova Scotia, New Brunswick, southeastern Quebec, and Maine."

It is not listed for Portland by Norton nor for Mt. Katahdin by Dutcher.

For Brunswick, Pope states as follows:

"Only five smoky shrews were taken in all and these in two widely separated localities. Too little evidence was collected to draw any definite conclusions about their habitat, but in general it seemed identical with that of personatus [cinereus]. Three of the five specimens were taken in the same valley as the woodland jumping mice but farther from the water." (1922:63).

Life History:

Presumably quite similar to Sorex cinereus.

There seems to be very little published material on the life history of this shrew. All the data for Maine that I have located is in Pope's article and is quoted above.

Economic Status:

This shrew serves as food, mainly for nocturnal predators.

Its food, in New York state, is as follows:

"Thirty-one stomachs of Sorex fumeus were examined. Every stomach contained insect remains, which comprised over 70 per cent of the food eaten. Centipedes, salamanders, plants, worms and sowbugs make up the rest. No mice were eaten." (Hamilton, 1930:38).

Sorex palustris albibarbis* (Cope). White-lipped Water Shrew.

General Description:

"A large, long-tailed Shrew specialized for an aquatic life; feet large and broad, hind feet especially so, fringed

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* Formerly Neosorex albibarbis.

with a row of short, stiff hairs; third and fourth toes united at base and somewhat webbed.

"Color.--Sexes colored alike; seasonal variation not especially marked.

"Upperparts dusky, some of the hairs white-tipped to produce a frosted appearance; tail sharply bicolor, blackish above, white below, tip dark; feet dark on outer side, whitish on inner; underparts white, sometimes darkened on breast and inguinal region, sharply differentiated from color of upperparts.

"Immature very much like adults." (Anthony, 1928:35).

The above description is for N. p. palustris; the form albibarbis is characterized as follows:

"Resembling typical palustris in pattern of coloration and in size, but underparts washed with dusky. Upperparts blackish slate, with light-tipped hairs; chin whitish; underparts suffused with dusky. Total length, [159 m.m.] 6.2 in. ; tail vertebrae, [69 m.m.] 2.7 in. ; hind foot, [19.5 m.m.] .76 in. " (Ibid., 37).

Range in Maine:

Probably everywhere present in small numbers.

For Katahdin:

"Two specimens of this rather scarce shrew were caught, one at 2400 feet, the other at 3000 feet, but assiduous trapping failed to secure others. A comparison of the two with the type in the National Museum shows them to be perfectly typical" (Dutcher, 1903:71).

A specimen of this shrew was taken at Norway, July 4, 1862 by G. W. Verril and recorded in Proc. Boston Soc. Nat. Hist., IX: 225 by A. E. Verrill.

Copeland and Pope (1917:160) state as follows:

"Although the water shrew is not so rare as the preceding species Microsorex , there are few records of its occurrence in Maine.

"Brunswick. Eight specimens have been taken in the following dates: October 22 and November 20, 1907; April 11 (three), April 20, May 4 and October 31, 1909."

"Upton. One procured by Dr. W. C. Kendall and presented to the Lee Museum of Biology, Bowdoin College. Date unknown.

"Brewer. W. M. Hardy informs us of the capture of a specimen by P. F. Eckstorm, March 3, 1909."

Mr. Norton does not record it for western Cumberland County.

Jackson (1928:183) lists the following Maine stations, some of which are referred to above:

Basin Pond, Mount Katahdin; Brunswick; Chimney Pond (altitude 3,000 feet), Mount Katahdin; Norway; Upton.

To the localities listed above, G. M. Allen (1904:30) adds Lincoln.

Life History:

But very little is known about this water shrew.

Regarding its habitat at Brunswick, Pope (1922:64) wrote as follows:

". . . At Brown's Opening and Maquoit albibarbis was taken in bushy woods, under fallen logs or in runways in the sphagnum close to the water's edge. The single individual caught at Coffin's Pond was in a strip of bushes between an open field and the shore. This shrew seems to have no fixed habitat as does personatus but follows watercourses in search of food."

Economic Status:

Too rare to be of any significance.

Hamilton (1930:39) examined stomachs of this shrew, in New York state, and reports as follows:

"Neosorex palustris albibarbis is represented by 13 stomachs. All had eaten insects, and 3 contained aquatic organisms, such as the nymphs of stoneflies, mayflies and planarians. It is doubtful if the water shrew gets much of its food from the water."

Microsorex hoyi thompsoni (Baird). Hoy's or Thompson's Pigmy Shrew.

General Description:

"A very small shrew, with short tail; except for size, resembling small members of the genus Sorex in superficial

appearance, but differing in cranial and dental characters.

"Color.--Sexes colored alike, seasonal variation not very marked.

"Upperparts.--Sepia brown; tail bicolor, above dark brown, below whitish.

"Underparts.--Ashy with a wash of buffy on throat, breast, and sometimes on belly.

"Immature pelage very much like adult.

"Measurements.--Sexes of equal size. Total length, [84 m.m.] 3.3 in. ; tail vertebrae, [33 m.m.] 1.3 in. ; hind foot, [10.7 m.m.] .42 in. ." (Anthony, 1928:39).

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"Jackson (1925, 126 and 1928, 202), recognizes seven subspecies of the pigmy shrew, and revives the name thompsoni for the representatives of the species from Ohio, Pennsylvania, New York, Vermont, Massachusetts, Maine, and the Canadian provinces south of the Saint Lawrence." (Norton, 1930:14).

The characters of the subspecies thompsoni are these:

"Slightly smaller than Microsorex h. hoyi, color averaging a shade more grayish in summer pelage, skull and palate shorter, dentition weaker. . . ." (Jackson, 1928:204).

Range in Maine:

The entire State is within the supposed range of this species.

This shrew was first recorded from Maine, in 1862, by A. E. Verrill, Proc. Boston Soc. Nat. Hist., IX, 169-170. Mention is made of an adult female taken at Norway and there is also described another specimen from Waterville. Apparently these are the same specimens referred to by Ezekiel Holmes in Second Ann. Rept. Nat. Hist. and Geol. Maine, 1862, in Seventh Ann. Rept. Sec'y. Maine Board Agriculture, 1862, p.119.

Dutcher does not mention this shrew. Mr. Norton mentions only Copeland and Pope's Brunswick and Topsham specimens for the vicinity of Portland.

Copeland and Pope (1917:161) state as follows:

"Brunswick. Seven specimens of this shrew have been taken on the following dates: December 9, 1907; January 11, 1908 (two);

April 27 and 28, 1912; May 4, 1912; May 13, 1917. They were trapped in damp woods near streams, and by holes in a bank bordering a brook in an open field.

"Topsham. One was secured by a dog, May 5, 1917, and examined through the kindness of F. E. Noyes.

"East Andover. Two specimens taken December 17 and 30, 1915, by G. Akers and M. A. Howard.

"Brassua Lake. One trapped May 7, 1916, under a stump in a clearing in moist woods.

"Holden. We are indebted to W. M. Hardy for three additional records of Microsorex from Holden. Two were secured by him in January, 1908, and one September 16, 1916.

"As there appear to be but three published instances of the capture of the least shrew in New England, the fourteen specimens noted above are of considerable interest."

Jackson (1928:205) lists the following Maine stations for this form, some of which have been mentioned above:

Brassua Lake; Brunswick; East Andover; Grace Pond, Somerset County; Norway; Waterville.

Life History:

There is very little recorded information on Hoy's Shrew.

The following is from Pope (1922:64):

"This little known shrew, the smallest of our native mammals, was first taken by the writer late in the fall of 1907. Of the four or five specimens taken only two were preserved as it was not distinguished from personatus. In May and June 1912 Dr. Manton Copeland trapped three in Brunswick and one from Topsham. Dr. Copeland's Brunswick specimens were taken in burrows along the banks of a spring run in an open mowing field, and were associated with meadow mice and star-nosed moles. The writer's specimens, on the other hand, were taken under old stumps near a little stream in heavy mixed woods, and were associated with the little masked shrew.

"To the untrained observer M. hoyi is indistinguishable from the masked shrew. It is slightly smaller in size, however, and its more slender tail and legs usually make identification possible without reference to the teeth, the final criterion. No important color differences are perceptible."

Economic Status:

Too scarce to be of any consequence.

Blarina brevicauda brevicauda (Say). Short-tailed Shrew; Mole Shrew.

General Description:

"A short-tailed Shrew with rather robust form. External ears very much reduced; tail less than half the length of head and body; legs short; pelage soft and velvety.

"Color.--Sexes colored alike; some seasonal variation.

"Upperparts.--Dark slate-colored in winter, paler in summer, glossy in new pelage; tail blackish above, paler below.

"Underparts.--Ashy gray.

"Immature much like adult pelage." (Anthony, 1928:42).

"Average of 31 specimens from Lake, George, New York: Total length, 127 m.m. [5 in.]; tail vertebrae 26.5 m.m. [1 in.]; hind foot 15 m.m. [.66 in.]. . . ." (Merriam, 1895; 11).

Southern New England specimens are considerably smaller than those from the type locality.

"Specimens from Nova Scotia, Ontario, New Hampshire, and Maine are larger [than Massachusetts specimens], agreeing with those from the Adirondacks. . . ." (Merriam, 1895:11).

This larger northeastern form was given subspecific status by Gapper, but the present day opinion seems to agree with Merriam's (1895:12), that talpoides is apparently indistinguishable from true brevicauda.

Maine specimens fall within the category of large northeastern individuals.

Range in Maine:

Abundant throughout the State.

At Katahdin:

"The short-tailed shrew is by far the most abundant mammal near Katahdin. In the clearing around the base camp, and in

the adjacent woods they swarm. I caught one in my hands in some diapensia turf just below the edge of the tableland, and trapped one on the tableland at 4500 feet." (Dutcher, 1903:69 and 70).

At Brunswick:

"Probably the most abundant mammal in this section of the country. Taken at all seasons in all the localities trapped, whether field or woodland, wet or dry. . . . "(Pope, 1922:64).

At Portland:

"Abundant nearly everywhere, and active at all seasons. It is found in places the most diverse in character." (Norton, 1920:14).

As judged by the trapping carried on by the Wild Life department of the University of Maine in the fall of 1936, this mammal is by far the most numerous. Of specimens taken, it even outnumbered the red-backed mouse more than 2 to 1.

Merriam (1895:13) mentions a specimen from North Sebago.

Life History:

Shull (1907), in Michigan, and Hamilton (1929), in New York state, have written important papers on the habits of this shrew. The latter author (1930) has also given an extensive account of its diet.

"On two occasions I have found the breeding nest and many times the smaller resting nest. On May 1, 1927, I found the large breeding nest of this species under a rotten log in a well wooded tract of low ground. . . . When the log was removed and the nest exposed, the female immediately ran from it. The nest was covered over, the entrance being on the side. Two runways led from the nest, in opposite directions, while a third went directly down below it. This nest was composed of entire dead elm leaves. It measured 8 inches across the top; the depth was 5¾ inches. The inner diameter of the nest was 2 inches across and the depth 2¾ inches. The inside was not seen when the log was lifted, the top of the nest being covered over by a thin roof of leaves. The lining was composed of the same material as that of the outside. . . ." (Hamilton, 1929:125).

Klugh (1921:35) writes of Blarina brevicauda at Lake Missanag, Ontario, as follows:

"The Blarinas fed on insects, both living and dead. They caught and consumed all the crickets (Gryllus assimilis and

Nemobius fasciatus) which previously had been common under the sod-cloth along the base of the walls of the tent, and also devoured any dead insects which I had rejected after killing in the cyanide bottle. On one occasion I saw one of them jump repeatedly at a sphinx larva which was suspended on a dead poplar twig a few inches above the ground, and at last succeed in pulling it down and into a tunnel of the dried grass. They ate with avidity anything of an animal nature, including pieces of salty chipped beef, and their particular delight was to get into the frying-pan and feed on the cold fat which it contained. So engrossed did they become in their gormandizing of this fat that they paid no heed to my presence and several times I took up the pan and walked about with it while they were thus engaged. They were not at all expert climbers and it was quite a feat for them to clamber over the high edge of the frying-pan. Once on top of the edge they tumbled in head-first.

"In hunting for food they seemed to depend entirely on their sense of smell, and when thus prospecting they wriggled their long pink snouts continuously and inserted them into every nook and crevice. They appeared to use their eyes merely in avoiding well-lighted situations."

Nelson (1918:489) writes thus:

"No cessation of their activity occurs in winter. When the cold weather begins many gather about barns and houses located near woods or old fields, and thus with the field mice take advantage of the garnered food supplies and shelter. Others remain in their regular haunts, where they frequently burrow long distances in the snow, making networks of tunnels and traveling long distances just below the surface, leaving little raised ridges like the track of a mole on the ground. Their journeys upon and under the surface of the snow appear to be in search of food, as they burrow down to old logs and stumps which make good feeding grounds. Their movements are very active, as they go about either at a walk or quick trot."

Economic Status:

Of the food of this species in New York state, Hamilton (1930:38) writes as follows:

"Stomach analysis of 244 Blarina brevicauda were made. Insects make up nearly one-half of the food, while next in abundance were vegetable matter, annelids, crustacea, molluscs, vertebrates, centipedes, inorganic matter, arachnids and millipedes in the order named. Only 4 stomachs contained mice. In the winter insects make up 60 per cent of the food eaten, and plant food is likewise taken extensively at this time."

Nelson (loc. cit.) writes thus:

"These fierce and truculent little hunters are wholly beneficial in their habits and should be encouraged in place of being killed on sight indiscriminately, as one of the ordinary mouse tribe."

Key to Maine Bats (Order Chiroptera)

A1 Interfemoral membrane naked.
Upper parts uniform in color, varying with individuals from sepia to cinnamon; length about 113 m.m. (4.41 in.); wing expanse about 300 m.m. (11.7 in.). Common Brown Bat.....Eptesicus fuscus fuscus (P. 30)

A2 Interfemoral membrane not naked.

B1 Entire upper surface of interfemoral membrane densely furred. Reddish or gray in color.

C1 Color rufous red or yellowish gray with a yellowish white shoulder-patch; length about 109 m.m. (4.2 in.); wing expanse about 2.75 m.m. (10.7 in.). Scarce. Northern Red Bat. .....Nycteris borealis borealis (P. 31)

C2 Larger than above and gray in color; length about 138 m.m. (5.5 in.); wing expanse 350-400 m.m. (13.7-15.6 in.). Rare. Hoary Bat.. .....Nycteris cinerea (P. 34)

B2. Entire upper surface of interfemoral membrane not densely furred.

C1 Interfemoral membrane well furred for at least basal half of upper surface. Other half scantily furred; color dark chocolate brown, tipped with silvery white; length about 100 m.m. (3.8 in.); wing expanse 225-250 m.m. (8.8-9.8 in.). Silver-haired Bat.....Lasionycteris noctivagans (P. 27)

C2 Interfemoral membrane not well furred for any portion of its length.

D1 Interfemoral membrane sparsely haired for basal third of upper surface; color dull yellowish brown above, pale yellowish gray below; length about 85 m.m. (3.3 in.); wing expanse 215 m.m. (8.4 in.). Northern Georgian Bat...obscurus .....Pipistrellus subflavus (P. 28)

D2 Interfemoral membrane sparsely haired on basal fourth of upper side; small size; color definitely brown.

C3 Ear about reaching nostril when laid forward; upper parts dull brown; membranes brown; length 90 m.m. (3.8 in.); extent 230 m.m. (8.9 in.). Little Brown Bat..... .....Myotis lucifugus lucifugus (P. 25)

C4 Ears reach well beyond tip of nose when laid forward; upper parts yellowish brown; membranes dark brown; length 95 m.m. (3.7 in.); extent 250 m.m. (9.8 in.). Say's Bat..... .....Myotis keeni septentrionalis (P. 26)

Order CHIROPTERA

Family Vespertilionidae

Subfamily Vespertilioninae

Myotis lucifugus lucifugus (LeConte). Little Brown Bat.

General Description:

"Diagnosis.--Color above ranging from yellowish brown (bronzy) to olive brown; a dark area at the shoulder; belly gray with a rich buffy suffusion; membranes not pale-edged; ratio of foot to tibia usually ranging from about 53 to 54.

"Description.--Two extremes or phases of color are found in the east. In the one the fur above is a glossy yellowish brown almost bronze, in the other it is browner. . . nearly 'ochraceous-tawny' (of Ridgway, 1912) varying individually in the depth of the bronzy tint to an olive brown (near 'Dresden brown'). At the shoulder there is a small contrasting area of darker, nearly blackish brown, forming an ill-defined spot. Bases of the hairs above and below blackish or dark plumbeous. The hairs of the lower surface are tipped with a rich buff, nearly the chamois of Ridgway, those at the extreme posterior part of the body without dark bases. Immature individuals are sooty gray above, the glossy tips of the hairs inconspicuous. Ears and membranes blackish brown." (Miller and Allen, 1928:44).

"Measurements.--Total length, 3.6 inches [92.1 m.m.]; tail vertebrae, 1.6 inches [41 m.m.]; hind foot, .35 inch [8.96 m.m.]; length of forearm, 1.5 inches [38.4 m.m.]." (Anthony, 1928:50).

"Myotis can generally be told by its small size, the only other North American Bat as small being Pipistrellus. These two genera, however, can probably not be distinguished on the wing by the layman." (Ibid., 56).

Range in Maine:

Found throughout the State.

For the Portland region Norton (1930:15) writes:

"Common summer resident, found usually in small numbers in barns, attics and unused chambers, though occasionally in large colonies. . . ."

Miller and Allen (1928:45) list specimens from the following Maine localities: Cupsuptic River; Eastport; Lincoln; Norway; Upton; Waterville.

Miller (1897:62) mentions an Eastport specimen.

Life History:

"The flight is quite erratic and as a rule the bat flies at no great height above the ground. It is difficult to observe when the light becomes dim because it seldom comes against the sky-line unless directly overhead.

"The voice of this Bat is a very fine, wiry squeak, and attention is often directed to the presence of Myotis by this note which, however, is pitched so high as to be inaudible to some individuals.

"Myotis spends the day in caves and, when these are not available, in hollow trees or under the eaves and in the roofs of buildings where they are not disturbed.

"Myotis may be seen flying in a great many environments, but is observed to best advantage at the edge of a forest clearing, over the surface of a lake or a slow-flowing stream, or at the opening of any natural tunnel such as a foliage-enclosed corridor under the trees, under bridges, or near an open shed or barn. This Bat often flies into houses if the doors or windows are open.

"I believe that the bats of this genus generally have but one young at a birth." (Anthony, 1928:55-56).

Economic Status:

A destroyer of flying insects of both beneficial and harmful species.

There seems to be no reliable evidence to show that bats are an agency for transplanting "bed-bugs" from house to house, as is commonly believed.

Myotis keeni septentrionalis* (Trouessart). (No common name; formerly known as Say's Bat.)

*Formerly Myotis subulatus subulatus (Say).

General Description:

"Color.--The color is not essentially different from that of M. lucifugus lucifugus in the bronzy phase, but the brown hair tips are neither so long nor so glossy. Consequently series of skins of the two species from the same region have an obviously unlike appearance due in part to the slight difference in color and in part to the less complete covering over of the slaty under fur in M. keeni septentrionalis. (Miller and Allen, 1928:106).

Measurements.--"Total length, 3.8 inches [97.3 m.m.]; tail vertebrae, 1.6 inches [41 m.m.]; hind foot, .36 inch [9.2 m.m.]; forearm, 1.5 inches [38.4 m.m.]; wing expanse, 10 inches [256 m.m.]." (Anthony, 1928:54).

Range in Maine:

Probably generally distributed throughout the State.

For the Portland region Norton (1930:16) writes as follows:

"The species is probably not uncommon here, but as little attention has been given to the collection of bats, we have only a meager knowledge of the abundance of these nocturnal and evidently local animals."

Miller and Allen (loc. cit.) list specimens from the following Maine localities: Eastport; Norway; St. George. Eastport is also mentioned by Miller (1897:76).

Life History and Economic Status:

See Myotis lucifugus lucifigus.

Lasionycteris noctivagans (LeConte). Silver-haired Bat.

General Description:

"Ears short, nearly as broad as long; when laid forward, reaching barely to nostril; basal lobe very large. Tragus short, straight, and bluntly rounded at tip, width much more than half length of anterior margin. Back of interfemoral membrane furred on basal half. Mammae 2.

"General remarks.--Among the American Vespertilionidae the genus Lasionycteris is readily distinguished by its dental formula, combined with its short, broad ears, broad tragus, and partially furred uropatagium." (Miller, 1897:85).

"Color.--The fur is deep, blackish, chocolate brown throughout, many of the hairs on the back, belly, and furred part of interfemoral membrane tipped with silvery white. The white tips are most numerous on middle of back. They are absent or nearly so, from face, crown, and throat." (Ibid., 86).

Miller (ibid.) gives the following average measurements for 10 New York specimens: Total length, 105.8 [4.13 in.]; tail vertebrae, 42.4 [1.66 in.]; tibia, 17.1 [.67 in.]; forearm, 41.1 [1.60 in.]; longest finger, 73.4 [2.87 in.]; ear from meatus, 15.9 [.62 in.].

Range in Maine:

"Although this Bat ranges over most of North America its distribution is somewhat irregular, and over large areas it is absent or very rare. It seems to prefer the banks of forested streams or mountain meadows where it appears when twilight has set in." (Anthony, 1928:56-57).

For specific information on this species in Maine, Norton (1930:16) reports thus for the Portland region:

"I have seen this bat only in August, but have known of its presence at Westbrook in September."

Life History and Economic Status:

Probably about the same as for Myotis, although as regards life history, there may be two young in a litter.

Pipestrellus subflavus obscurus Miller. Northern Georgian Bat.

General Description:

Of typical subflavus Miller (1897:91) writes thus:

"General characters.--Size small (forearm, about 34); thumb long (about 1/5 forearm); ear when laid forward reaching slightly beyond nostril; tragus straight, tapering to a broadly rounded tip; feet small, slightly more than half as

long as tibia; terminal 2 m.m. of tail free from membrane; hairs on back mostly distinctly tricolored; general color light yellowish brown, undulated with darker brown."

"Membranes.--The membranes are thin and delicate. Urapatagium thinly furred on basal fourth, otherwise naked except for a few scattered hairs along veins on lower side. Wing membranes attached at base of toes. Urapatagium attached at base of terminal caudal vertebra."

Of subflavus obscurus, the same author (p.93) writes:

"General characters.--Size and proportions as in typical subflavus, but color duller and less yellow, and dark tips of shorter hairs on back more conspicuous.

"Ears, membranes, feet, and fur.--As in typical subflavus.

"Color.--Fur everywhere blackish slate at base. Middle band on shorter hairs of back dull, pale, wood brown or isabella color. Tips of these hairs dusky brown, and much more conspicuous than in true subflavus. Long hairs of back pale wood brown. Belly uniform isabella color, in some specimens inclining toward wood brown, but seldom showing any approach to the bright yellowish brown of true subflavus.

"A melanistic specimen is dark chocolate brown throughout. Two others are rich reddish brown. In all three of these abnormal individuals the characteristic variegation of the fur of the back still persists."

Measurements.--The same writer (p. 95) gives the following measurements for obscurus: Total length, 84 [3.28 in.]; tail vertebrae, 38.9 [1.52 in.]; tibia, 15.2 [.59 in.]; foot, 8 [.31 in.]; forearm, 36 [1.40 in.]; ear from meatus, 14 [.55 in.]; tragus, 6.8 [.26 in.].

Range in Maine:

Apparently a straggler thus far north.

This species is listed for Maine by G. M. Allen (1904:34) as follows:

"Me.--(J.A.Allen.)".

The only other mention of this species within the State is by Norton (1930:17) and is as follows:

"I took one of these bats August 18, 1900, in Windham where it was flying at dusk over the Presumpscott River, be-

tween wooded banks; and another in Westbrook, September 15, 1903, when flying also at dusk over sprout land pasture along the edge of a mixed old woods. On both occasions several were seen.

Economic Status:

A feeder on flying insects, but as a straggler, this bat is too scarce to have any economic significance in Maine.

Eptesicus fuscus fuscus (Beauvois). Common Brown Bat; Big Brown Bat.

General Description:

"General characters.--Size large; total length, 110 to 112 [4.29-4.37 in.]; tail vertebrae, 41 to 52 [1.60-2.03 in.]; forearm, 43 to 46 [1.68-1.79 in.]; longest finger, 77 to 84 [3.01-3.28 in.]; ear, 11.6 to 14 [.45-.54 in.]; ears and membranes thick and leathery; crowns of upper molars narrow; color variable, but seldom very dark."

"Fur and color.--On middle of back the fur is about 12 m.m. long. The fur extends along the sides in a line about m.m. wide on wing membranes both above and below. The proximal third or fourth of urapatagium is furred. Otherwise the membranes are naked except for a few scattered hairs on the under side of the interfemoral membrane and on the under side of the wings close to the humerus and forearm.

"Color brown throughout, but always paler on belly than on back. The exact shade varies considerably, but is usually a clear bister or sepia. Sometimes, however, it approaches cinnamon. Ears and membranes blackish in dry specimens." (Miller, 1897:96-97).

Range in Maine:

Probably to be found throughout the State, although its known range does not extend northward much beyond our northern boundary.

For the Portland region Norton (1930:17) writes as follows:

"Common in spring and fall, and not rare in summer. I have found it usually by margins of old woods near small brooks. It has several times been found in attics and cellars in winter."

Miller (1897:98) lists four specimens from Eastport.

Life History:

"Eptesicus is the commonest of the larger bats found in the United States. Its size and fairly steady flight are good distinguishing characters. Although its flight traces abrupt changes of direction, it is one of the least erratic flyers among the North American Bats. It is not infrequently heard to utter its high-pitched, squeaky call, and is often seen about street lights in large cities where it finds congenial abodes in dark nooks in the roofs or inaccessible crannies in the buildings."

"The number of young at a birth is one or two. The Big Brown Bat either hibernates or migrates from the regions of cold autumns and winters. . . ." (Anthony, 1928:60).

Economic Status:

A destroyer of flying insects.

R. W. Shufeldt has stated somewhere that, in the course of a single night, a Brown Bat consumed twenty-one full-grown June bugs, leaving only a few legs and hard outside wing-sheaths.

Nycteris borealis borealis (Muller). Northern Red Bat; New York Bat.

General Description:

"General characters.--Size small (forearm, 38 to 43 [1.48-1.68 in.]; longest finger, 78 to 88 [3.05-3.44 in.]; forearm with no distinct tuft of fur near proximal end; color very variable, ranging from bright yellowish red or fawn color to yellowish gray; a whitish area in front of shoulder.

"Ears.--The ears of typical Lasiurus Nycteris borealis . . . when laid forward reach a little more than halfway from angle of mouth to nostril. . . ."

"Membranes.--The flight membranes are attached at base of toes, the uropatagium at extreme tip of tail."

"Fur and color.--The fur is everywhere full and soft. On middle of back it is about 7 m.m. in length and on neck about 10 m.m. It covers the basal two-thirds of dorsal side of ear, the whole dorsal side of the interfemoral membrane, and the dorsal side of the flight membrane to a line running from ankle to middle of humerus. There is a narrow strip of fur running

along basal third of fifth metacarpal and a squarish clump at base of thumb. Near base of forearm (in position occupied by strip of fur in L. cinereus N. cinerea) there are numerous fine scattered hairs, which are so inconspicuous as readily to escape notice. On the ventral surface the fur reaches about to middle of uropatagium and on flight membranes to line joining knee and elbow. Beyond elbow a sparse growth of hairs covering an area 10 m.m. or more in width extends along forearm to bases of fingers, where it becomes much more dense. The antebrachial membrane is covered with a sparse coating of hairs on the ventral surface.

"In color typical Lasiurus [Nycteris] borealis varies very extensively. . . Red specimens are rufous red throughout (the exact shade somewhere between rufous and burnt sienna), paler and more fawn-colored on the belly, the hairs of the back usually with distinct grayish tips, those on the throat and chest tipped with whitish. A yellowish white patch in front of each shoulder. Frequently the white on chest tends to connect the shoulder patches by a whitish collar. The individual hairs on the back are blackish at base, then light rufous to the narrow subapical band which gives the characteristic color to the back, and, finally, grayish white at extreme tips. Gray specimens are yellowish gray on the back and buffy on the belly. The red usually persists as a faint salmon suffusion." (Miller, 1897:106-107).

Measurements.--The same writer (page 115) gives the following average measurements for 10 New York specimens: Total length, 110.4 [4.31 in.]; tail vertebrae, 50.9 [1.98 in.]; tibia, 19.6 [.76 in.]; forearm, 39.7 [1.55 in.]; longest finger, 81.7 [3.19 in.]; ear from meatus, 11.9 [.46 in.].

Range in Maine:

Miller (ibid., 106) gives the complete range of this bat as "through the Boreal, Transition, and Austral Zones in eastern North America from Canada to Florida and Texas, west at least to Indian Territory ! and Colorado. Southern and western limits of range not known. Probably breeds throughout its known range.

Definite Maine records are as follows:

Westbrook, July 29, 1901 (Norton, 1930:18).

Brunswick, migrants the first week in September, and a specimen taken there October 2, 1900 (Pope, 1922:65).

Seguin Island, near Small Point, migrants in early fall (Norton, loc. cit.).

Life History:

"The Red Bat is more of a tree Bat than any of the other North American Bats and is consequently never found away from the forests, except possibly during migration. It spends the daytime hanging amongst the leaves and it rather closely resembles a dead and brown leaf. It is said to be solitary in habit and only one or two are found together.

"This Bat appears in the air rather early in the evening and is not infrequently seen abroad in the daytime. It enters houses in pursuit of insects just as does Eptesicus and Myotis and can readily be identified by its very distinctive reddish color.

"The Red Bat is a very rapid flyer and follows an erratic course fairly well up above the ground. The rapidity of flight, large size, and long narrow wings are the best field characters.

"Bats of this genus have four mammae and the number of young at a birth varies from one to four. If the mother has four young the combined weights of her offspring may exceed her own weight; and, since she carries them with her until they are able to fly for themselves, it indicates very marked powers of flight.

"The Hoary Bat is like the Red Bat in its preference for forests, its long pointed wing, swift, erratic flight, and the number of young, (ofter four), but differs in its greater size, gray instead of reddish color, later appearance in the evening, and generally higher course of flight. This Bat is not common anywhere and does not take to the air until the twilight is nearly past. It is one of the least known of our widely ranging Bats. A specimen in the hand can not be mistaken for any other species and it is easily the most handsome North American Bat.

"There are many observations on record to show that the species of Nycteris migrate with the coming of the autumn frosts." (Anthony, 1928:62-63.)

Economic Status:

The Red and Hoary Bats eat flying insects, probably both beneficial and harmful species.

Nycteris cinerea (Beauvois). Hoary Bat.

General Description:

"General characters.--Size, large (forearm over 50 m.m. [2 in.]); prevailing color, gray; ears with black rims; forearm with distinct patch of fur near base." (Miller, 1897: 112).

"Similar in general structure to its congener, the Red Bat, in the following characters: broad, low ear which is furred almost to the tip, rimmed with black; tragus broad basally; pelage long and lax; interfemoral membrane heavily furred above; wings furred along forearm as far as wrist on underside. Larger than the Red Bat and gray instead of red in color.

"Upperparts grayish white, with darker basal color of pelage showing through; hairs brownish black at base, then pale yellowish brown, followed by a narrow band of chocolate-brown and finally tipped with whitish. Underparts yellower and without so much of the white tipping except on throat where long hairs form a sort of ruff colored like back. Membranes brownish black except for a narrow yellowish brown strip along forearm and half way down fingers on upperside." (Anthony, 1928:61-62).

Measurements.--Miller (1897:115) gives the following average measurements for four New York specimens: Total length, 134.5 [5.25 in.]; tail vertebrae, 57.5 [2.34 in.]; tibia, 23.2 [.90 in.]; forearm, 50.2 [1.96 in.]; longest finger, 107 [4.19 in.]; ear from meatus, 18 [.70 in.].

Range in Maine:

Probably occurs in the State more frequently than the literature indicates, for a specimen taken in Topsham in the spring of 1905 (Pope, 1932:65) seems to be the only recorded one from within our boundaries.

Life History and Economic Status:

See Nycteris borealis borealis.

Key to Maine Flesh-eaters (Order Carnivora)

A1 Claws not retractile.
- B1 Tail rudimentary. Bears. (Family Ursidae) Black Bear.....*Euarctos americanus americanus* (P. 37)
- B2 Tail well developed and long.
  - C1 Feet plantigrade; hind feet with 5 toes. Raccoons. (Family Procyonidae). Raccoon.. .....*Procyon lotor lotor* (P. 39)
  - C2 Feet digitgrade; hind feet with 4 toes. Wolves, foxes, etc. (Family Canidae)
    - D1 Color of tail uniform; size large; length 1433-1643 m.m. (56-64 in.). Eastern *lupus* Timber Wolf.....*Canis lycaon* (P.66)
    - D2 Tip of tail white; size smaller. Foxes.
      - E1 Color typically bright golden yellowish; tail darker, with a white tip.; length about 1045 m.m. (41 in.). Eastern Red Fox. .....*Vulpes fulva* (P. 63)

A2 Claws more or less retractile.
- B1 Hind feet with five toes. Minks, weasels, skunks, etc. (Family Mustelidae).
  - C1 Tail very bushy.
    - D1 With dorsal or lateral stripes of lighter color.
      - E1 Colors black with white dorsal stripes and white in tail (rarely nearly all black); habit generally terrestrial. Common Skunk..... .....*Mephitis nigra* (P.61)
      - E2 Colors blackish-brown with a well-marked yellowish lateral stripe; form stout; length 947-1050 m.m. (37-41 in.). Wolverine..... .....*Gulo luscus* (P. 56)
    - D2 Body without dorsal or lateral stripes.
      - E1 Body slender; length about 614 m.m. (24 in.). American Marten. .....*Martes americana americana* (P. 41)
      - E2 Body stout; much larger; length about 947 m.m. (37 in.). Fisher. .....*Martes pennanti pennanti* (P. 44)
  - C2 Tail not bushy.
    - D1 Fore and hind feet fully webbed; size large; habit aquatic. Otter..... .....*Lutra canadensis canadensis* (P. 58)
    - D2 Feet not webbed or partially webbed; size smaller. Weasels and minks.
      - E1 Belly always white (animal dark above in summer, white in winter). Weasels.

F1 Distal part of tail black for nearly a third of its length.
G1 Size larger; length 332-417 m.m. (13-16.3 in.); tail 108-140 m.m. (4.2-4.5 in.) New York Weasel.....Mustela noveboracensis noveboracensis (P.48)
G2 Size smaller; length 230-281 m.m. (9-11 in.); tail 69-80 m.m. (2.7-3.1 in.). Bonaparte's Weasel...Mustela cicognanii cicognanii (P.46)
F2 Terminal hairs only of tail black; tail very slender; length 345-460 m.m. (13.5-18 in.); tail 115-179 m.m. (4.5-7 in.). Northern long-tailed Weasel....Mustela occisor (P.51)
E2 Brown above and below at all seasons. Minks.
F1 Color dark brown; breast and chin usually spotted with white; length about 610 m.m. (24 in.); tail under 178 m.m. (7 in.) Little Black Mink.....Mustela vison vison (P.52)
F2 Color darker; size larger; length about 630 m.m. (25 in.); tail over 178 m.m. (7 in.). Common Mink.. .....Mustela vison mink (P.55)
B2 Hind feet with 4 toes. Cats. (Family Felidae).
C1 Tail 622 m.m. (24 in.) or more; weight about 150 pounds. Couguar.....Felis couguar (P.67)
C2 Tail 178 m.m. (7 in.) or less; weight under 50 pounds. Lynxes.
D1 Tail about 102 m.m. (4 in.); feet very large; ears tufted; fur long and loose. Canada Lynx.....Lynx canadensis canadensis (P.69)
D2 Tail about 178 m.m. (7 in.); feet smaller; ears not tufted; fur short and dense. Bay Lynx.....Lynx rufus rufus (P.70)

Order CARNIVORA

Family Ursidae (Bears)

Euarctos americanus americanus (Pallas). Black Bear.

General Description:

"A medium-sized Bear of dark coloration, black or dark brown in color; claws of forefeet curved, slightly longer than those of hind feet; facial profile straight, not dished; pelage long and moderately soft.

"Sexes colored alike; some seasonal variation, in length and glossiness of pelage."

"Measurements--"Total length, about 60 inches; tail vertebrae, 5 inches; hind foot 7.25 inches; height at shoulders, 25 inches. Weight from 200 to 450 or 500 pounds." (Anthony, 1928:74-75).

Range in Maine:

Bears are still to be found in every county in the State, although they occur only as stragglers in the extreme southwestern section.

For the Portland region Norton (1930:19) writes as follows:

"This animal, though common in early times, has long been practically extirpated from this region. Stragglers, however, wander occasionally to the outskirts of the section, or even nearer to Portland. One was killed at East Sebago, November 5, 1926, by J. Leland Kenney. . . ."

Life History:

"From the landing of the first colonists on our shores, hunters and settlers have encountered black bears so frequently that these are among the best-known large forest animals of the continent. During the winter they hibernate for months, seeking a hollow tree, a low cave, the half shelter of fallen tree trunks and brush, or else digging a den for themselves. The female chooses a specially snug den, where in midwinter from one to four cubs are born. At birth the young, only 8 or 9 inches long, are practically naked and have their eyes closed. They are so undeveloped at this time that it is more

than a month before their eyes open and more than two months before they can follow their mother." (Nelson, 1918:437).

"Except in early spring, black bears live principally upon vegetable food; blueberries are their favourite diet, though fruit of any kind seems to suit them well enough.

"They also dig for roots and bugs, and catch grasshoppers and crickets in the grass." (Stone and Cram, 1902:258).

Long ago Henry Clapp, a trapper of Brownville, Maine, presented the following data on bears in this State:

"Bears hibernate, going from three to four months without eating; sometimes during December, January, February, and March, sometimes during January, February, March, and April. This year 1868? there are no beechnuts, and they will probably disappear early. As soon as they begin to eat in the spring, a plug comes away from them, black, shining, and hard, resembling gum, so much so, that some say they eat gum to form it; but it is not so, for the same came from the tame ones in my barn, where they could get no gum. I think it is from the mucous in the intestines. In the barn they covered themselves with straw all over, excepting their ears. Their paws were brought forward around the nose, which was dropped forward and downward. They don't suck their paws. When I spoke to the tame ones in my barn during the winter, they would look up very bright, but would run out their tongue, gape, and drop their heads forward and down between their paws again. I could see the motion of their breathing, and in a cold day could see their breath condensing. I noticed this particularly, because I have heard it said that they did not breathe when hibernating. In the woods they make for winter quarters a nest of leaves and cedar bark, and I have sometimes seen cedar and fir boughs in their nest. I don't think they get enough of the material to cover themselves as completely as the tame ones did in my barn.

"Bears bite fur and spruce trees, and tear down the bark, and when one has bitten a tree, others are apt to do the same, and thus their ranges or lines of travel become spotted as it were. They follow their ranges year after year. . . ." (Clapp, 1868:658-659).

Economic Status:

That the black bear was probably used for food by the Indians is attested by the presence of remains of this animal in shell heaps; that its skin was used by them for clothing is shown by Josselyn's statement to that effect, quoted by Norton (1930:20).

Bears in Maine have been subject to bounty in various sections, or all, of the State, intermittently, since about 1820. The bounty amounted to three dollars from 1832-1833; two dollars from 1835-1869; five dollars from 1870-1924 (in certain counties only and ten dollars in Washington and Penobscot Counties, 1921-1924); twenty-five dollars from 1929-1932 and 1935 to the present. Where the bounty is twenty-five dollars, it is optional in towns where bears are killing sheep.

At present the "bear bounty towns" are distributed, in numbers, by counties, thus: Aroostook, 15; Piscataquis, 8; Oxford, 7; Franklin, 5; Washington, 4; Penobscot, 3; Somerset, 1.

None of the coastal counties, except Washington County, has a bounty town in it. In Washington, one of the bounty towns is Trescott, bordering on Lubec, and a coastal town.

At the present time there is a strong movement under way to give bears in Maine more protection, because of their value as a game species.

"The success of black bears in caring for themselves is well demonstrated by the number which still survive in the woods of Maine, New York and other long-settled States. Their harmlessness and their exceeding interest to all render them worthy of careful protection. They should be classed as game and thoroughly protected as such except for certain open seasons. If this is done throughout the country, as is now the case in certain States, the survival of one of our most characteristic large wild animals will be assured." (Nelson, 1916:437).

Family Procyonidae (Raccoons)

Procyon lotor lotor (Linnaeus). Raccoon; Coon.

General Description:

"A robust, fair-sized carnivore with long pelage and long, banded, rather bushy, tail. Muzzle long and slender; head broad across the jowls; ears erect and prominent; form thick-set; fore- and hind-feet with five toes bearing non-retractile claws; soles naked, hind feet plantigrade; tail moderately long and bushy, cylindrical; pelage thick and heavy; habit somewhat arboreal; nocturnal.

"Color.--Sexes colored alike; some seasonal variation.

"Upperparts.--Grizzled gray, brown, and black, the pelage dull brown at base; a black band across forehead and eyes, grayish on muzzle and back of ears; ears grayish, with black area at posterior base; sides with less black than dorsal region; tail banded with alternate grayish and blackish, six or seven dark rings; gray of upperparts, except that on head, is strongly mixed with yellowish; hands and feet yellowish gray.

"Underparts.--Dull brownish, grizzled with yellowish gray.

"Immature very much like adults.

"Measurements.--Total length, about 30 inches [768 m.m.]; tail vertebrae, 10 inches [256 m.m.]; hind foot, 4.5 inches [115 m.m.]; weight from 15 pounds average up to 49 pounds maximum." (Anthony, 1928:86-87).

Range in Maine:

Found throughout the State, but probably not "abundant" anywhere.

Life History:

"Raccoons, like most other climbing animals, make frecuent use of the nests of hawks and crows to sleep in. At other times they flatten themselves along the thick branch of a tree, their grey fur harmonizing admirably with the colour of the bark, or else they ascend to the tops of dense foliaged hemlocks and, circling their fat bodies completely around the main stem, doze away the time in comfort, supported by the numerous elastic branches about them, quite invisible from the ground. If a company of blue jays discover one in this position there is sure to be a tremendous racket right away, their shrill voices jarring the quiet of the tree-tops like an alarm clock set to awaken the coon from his slumbers." (Stone and Cram, 1904: 251).

"The young raccoons vary from three to six in number, and are born in April or May. At first they are as blind and helpless as young kittens, and remain under the care and protection of their parents for the first season at least. Their crying when they are separated from the old ones is said to resemble that of a human infant under similar circumstances.

"The adults also have a kind of whimpering cry or call which is often heard on moonlight nights. It seems to be of a

somewhat variable nature, at times resembling the quavering note of a screech owl or laughing hoot of a barred owl, and again sounding like a colt's whinnying.

"This similarity to other sounds of the country renders it hard to identify, and from various circumstances I am inclined to think that it is never to be heard at any great distance.

"On the arrival of cold weather young and old curl themselves up together; occasionally several families will occupy the same hollow tree. In this manner they pass the first and severest part of the winter in a more or less lethargic condition, hardly relapsing into such a state of unconsciousness that a few days of warm weather will not tempt some of them out on the snow." (Ibid., 252).

Economic Status:

Norton, in his paper on mammals of the Portland region, states (1930:24) that, "it was hunted for its fur, its flesh and as a pest, from early time until 1913, when it was given seasonal protection as a 'fur bearing animal'."

The average annual catch of raccoons reported by Maine trappers, as computed over the 8-year period of 1928 to 1935, inclusive, was 1,419 pelts. These were distributed annually as follows:

1928	3,284
1929	1,085
1930	230
1931	1,612
1932	692
1933	1,058
1934	1,056
1935	2,336

Family Mustelidae

Subfamily Mustelinae

Martes americana americana (Turton). American Marten; Pine Marten; Sable.

General Description:

"A small carnivore of weasel-like form, a little smaller than a House-cat, with soft, rich pelage, bushy tail, and

ochraceous or buffy patches on throat and chest. Head rather small; ears broad and rounded; body long and lithe; limbs short; toes five on each foot, claws sharp and slender; soles densely hairy; tail about half as long as head and body, bushy, cylindrical; habit more or less arboreal.

"Color.--Sexes colored alike; no very marked seasonal variation in color.

"Upperparts.--Uniform rich yellowish brown mixed with hairs which are dark brown; dark brown on legs and tail; ears edged with whitish; top of head warm brown. Tone of upperparts varies from warm yellowish brown, almost olive, to light buffy brown with ochraceous tinge, and top of head from brown to almost white.

"Underparts.--Slightly warmer in tone than upperparts and without the yellowish tinge to the brown; an irregular area of bright ochraceous buff on throat and chest.

"Immature very much like adults.

"Measurements.--Males larger than females. Total length, males, 23-25 inches [589-640 m.m.]; tail vertebrae, 7-8 inches [179-205 m.m.]; hind foot, 3.3-3.5 inches [84-90 m.m.]." (Anthony, 1928:93-94).

Range in Maine:

Seton (1929, II:487) writes:

"Maine (Famous for the abundance and quality of its Martens. Of the former, the many quotations from Manly Hardy are evidence. The quality is as high as ever, but the Martens have become very scarce, and are rarely seen now in the southern part of the state)."

Norton (1930:25) states that:

"The sable is a denizen of the extensive evergreen forests of the northern parts of North America, including the northern parts of Maine.

"It appears to have been a straggler in the Portland region, . . ."

Pope in his paper on Brunswick mammals writes (1922:63):

"Practically unknown here now. Mr. Perry reports the capture of a single animal on the Muddy River* several years

*In Topsham, Sagadahoc County.

ago."

Dutcher (1903:70) stated that at Katahdin it was then common up to the timber line.

Life History:

"Like other members of the weasel tribe, the marten is a fierce and merciless creature of rapine, but unlike the mink and weasel, it avoids the abodes of man and loves the remotest depths of the wilderness."

"Practically every living thing within their power falls victim to their rapacity. They eat minks, weasels, squirrels, chipmunks, wood rats, mice of many kinds, conies, snowshoe hares, ruffed and spruce grouse, and smaller birds of all kinds and their eggs, as well as frogs, fish, beetles, crickets, beechnuts, and a variety of small wild fruits. Unlike minks and weasels, they are not known to kill wantonly more than they need for food.

"They make nests of grass, moss, and leaves in hollow trees, under logs, among rocks, and in holes in the ground. Sometimes they have been found in possession of a red squirrel's nest, probably after having slain and devoured the owner.

"The young, varying from one to eight in number, are born in April or May. At first they are naked and helpless, but when large enough accompany the mother on her search for food. This period of schooling lasts until they are forced to take up their separate lives with the approach of winter. Thenceforth they are among the most solitary of animals, showing fierce antagonism toward one another whenever they meet, and associating only during a brief period in the mating season in February or March. . . ." (Nelson, 1918:47).

More specific information regarding this animal in Maine is to be found in the following quotations:

"Sable sometimes will not take bait. Besides catching Mice, Squirrels, Rabbits, and birds, they often feed on the berries of the mountain ash and sometimes they will climb a tree to eat these berries, not noticing a well-set trap close by. They are an unsuspicious animal and are easily trapped when they will take bait." (Quoted from Manly Hardy by Seton, 1929, II:494).

"The Sable is of about the size of the mink, a little larger, and with longer legs. Its color is red or yellowish. It lives on mice, squirrels, partridges, rabbits, beechnuts, and mountain-ash berries. It don't like porcupine meat as well

as the fisher. It will eat fresh fish, but I don't think it catches fish. I catch them in a "dead-fall" trap, sometimes in a steel-trap. I catch them in the mountains north of here [Brownsville?]. They nest in hollow trees. I never saw a sable swim; I once thought I saw one swimming, but when I caught the animal, I found it to be a mink, with the sable's color. They are never very plenty about here. . . ." (Clapp, 1868:655).

Economic Status:

This species is much prized for its skin.

Clapp spoke as follows about this animal in Maine shortly after the Civil War:

"Price of skins last winter 1866-67 , $2.25 to $2.50; year before last, $3.50 to $3.75."

Apparently, before the Civil War, this animal was rather numerous in northern Maine, to judge by the statement from Manly Hardy quoted by Seton (1929, II:490):

"In the fall of 1859, Manly Hardy, the well-known hunter-naturalist of Brewer, Maine, went with a partner, Rufus B. Philbrook, on a trapping venture in the vicinity of Caucomogomoc Lake, Northern Maine. They went into camp, Oct. 7th.

"After a month, Hardy returned. His partner continued 3 weeks alone. Their 'total catch was 4 Bears, 3 Lynx, 2 Otter, 4 Fisher, about 50 Sable, 35 Mink, 7 Beavers, and 75 Muskrats.'"

The average annual catch of Martens reported by Maine trappers, as computed for the eight-year period of 1928-1935, inclusive, was 35 pelts.

Martes pennanti pennanti (Erxleben). Fisher; Pekan; Blackcat.

General Description:

"A large powerful Marten, much larger and darker than the Pine Marten but very similar to it in general structure; pelage long and soft.

"Color.--Sexes colored alike; seasonal variation not conspicuous. General tone varying from grayish brown to warm brown, darkest along dorsal region where it may be almost

black; nose, feet, and tail blackish; top of head grizzled with gray which extends down neck to shoulders; dark brown on throat, chest, and belly.

"Measurements.--Males larger than females. Males: total length, 36-38 inches [922-973 m.m.]; tail vertebrae, 15 inches [384 m.m.]; hind foot, 4 inches [102 m.m.]; weight, 8 to 12 pounds or up to about 18 as a maximum; weight of females, about 5 pounds." (Anthony, 1928:97).

Range in Maine:

"They still occur regularly in the Adirondacks of New York and the Green Mountains of Vermont and in Maine, but are gone from most of the southern border of their former range." (Nelson, 1918:445).

For the Katahdin region, Dutcher stated (1903:69):

"From the accounts of our cooks the fisher is one of the commonest and most valuable of their fur bearing catch."

Life History:

"Although essentially a tree animal, much of the fisher's time is spent on the ground. In summer it appears to be fond of heavy forests in low-lying situations and the vicinity of water. Its dens are usually located in a hollow high up in a large tree, but sometimes in the shelter of fallen tree trunks or crevices in the rocks, where, the last of April or early in May, the young are born. These may number from one to five, but are usually two or three. The young begin to follow the mother in her wanderings when quite small and do not leave her guardianship until nearly grown." (Nelson, loc. cit.).

"The Fisher is much like the sable, but larger, weighing six times as much, say from eight to ten pounds, some more than this. They live on rabbits, partridges, squirrels, and berries, especially berries of the mountain-ash; they are also very fond of porcupines, the skins often having quills stuck in them, which, however, do not enter far into them. They also eat beechnuts. The Fisher runs with a "lope" and a jump; I never saw one trot. He leaves but two tracks, one a little farther forward than the other, thus, . , as do also the mink and sable. Sometimes they leave more, but the habit is to leave two. The color is dark-brown or gray. He nests in hollow pine stumps and ledges, I think. They are not very plenty about here Brownsville? . I caught seven last fall, and one this fall. The trap was set with bear's meat. . . ." (Clapp, 1868:655).

Seton (1929, II:461) quotes Manly Hardy* to the effect that the latter knew of several fishers being found in company. Hardy considered this unusual.

Seton (ibid., 475) quotes Hardy's account of a fisher that jumped from a ledge onto the back of a large buck. The deer's trail showed where it had bled and stumbled in the snow as a result of the fisher's attack.

Seton (ibid., 476) quotes Manly Hardy from Shooting and Fishing, April 13, 1899, p.526, as follows:

"Their food consists of Porcupines largely. . . . It seems to swallow the quills of Porcupines without any injury. I have examined many hundreds of Fisher skins where there were quills lying flat against the skin usually either on the back of the neck, or lower part of the back, but I never say any signs of their causing any sores or suppuration, as they do in a dog. While I had skins of Fox, Raccoon, and Wildcats, which have been picked up dead, with their necks just filled with Porcupine quills, which evidently had caused their death, I have never seen a quill sticking in a Fisher; and the same is true of Bears, which also eat a great many Porcupines. In eating Porcupines, they do just as Bears do, turn them over on their backs, and eat out most of the meat, leaving the skin nearly entire."

Economic Status:

The average annual catch of fishers reported by Maine trappers, as computed for the eight-year period of 1928-1935, inclusive, was 29 pelts.

Mustela cicognanii cicognanii Bonap. Bonaparte's Weasel.

General Description:

"General characters.--Size small; tail slender and rather short; color of under parts covering toes and inner sides of both fore and hind feet; color of upper parts never encroaching on belly, but ending along a straight line.

"Color.--Upper parts in summer pelage: uniform dark brown, hardly darker on head; end of tail blackish; no dark spot be-

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*Hardy was a trapper and fur-buyer whose home was in Brewer.

hind corners of mouth; under parts, usually including upper lip, white, more or less tinged with yellow. In winter pelage: pure white with a strong yellowish tinge on rump, tail, and under parts; end of tail black."

"Measurements.--Average of 5 males from Ossipee, N. H.: Total length, 278 [10.86 in.]; tail vertebrae, 80 [3.13 in.]; hind foot, 36.5 [1.42 in.]. Average of 3 females: Total length, 230 [8.98 in.]; tail vertebrae, 69 [2.69 in.]; hind foot, 30.5 [1.19 in.]." (Merriam, 1896:11).

Range in Maine:

The territory occupied by this weasel includes the whole of this State.

At Katahdin:

"Very common in the woods in the south basin, and occurring at all altitudes. I caught one on the tableland in a caribou runway leading to a spring, and three at Chimney Pond. All these specimens* are peculiar in the deep rich yellow of the under parts, which varies from sulphur to rich saffron, differing thereby from all the specimens that I examined in the Biological Survey and American Museum Collections." (Dutcher, 1903:70).

Both Mr. Norton and Pope speak of this weasel as being more numerous than the long-tail in their reports from Cumberland County.

Branin (1936:174) speaks of taking it on Mount Desert Island.

The present writer has observed it on the University grounds at Orono.

Life History:

Probably the only differences in life history between M. cicognanii and M. noveboracensis are due to the fact that cicognanii is smaller and, therefore, adapted to eating smaller prey.

For a very important paper on the life history of weasels see W. J. Hamilton, Jr.'s "The Weasels of New York," American Midland Naturalist, XV, No. 4, July 1933, pp.289-344.

Economic Status:

See the account under M. noveboracensis.

* Taken during early summer.

Mustela noveboracensis noveboracensis (Emmons). New York Weasel.

General Description:

"General characters.--Male large; female small; tail long and bushy, much longer than in cicognanii, but shorter than in longicauda; the black terminal part longer than in any other species, covering one-third to one-half the tail and measuring 50 to 75 m.m. Animal turns white in winter in northern part of range. Extraordinary sexual difference in size and cranial characters.

"Color.--Summer pelage: Upper parts, including fore and hind feet and anal region, and often encroaching irregularly on belly, rich dark chocolate brown, sometimes suggesting seal brown; under parts (usually including upper lip) white, more or less washed with yellowish; no yellow on under side of tail or on hind feet, the color of underparts stopping short of ankle. Winter pelage: In southern part of range similar to summer pelage, but upper parts paler, nearly drab brown. Northern specimens nearly white all over except terminal third of tail, which is jet black; throat, belly, posterior half of back and tail always suffused with yellowish."

"Remarks.--Putorius noveboracensis [Mustela noveboracensis] may usually be distinguished from P. cicognanii by larger size and also by the longer and more bushy tail, and greater length of the black terminal part. Females of noveboracensis, however, sometimes resemble males of cicognanii rather closely. They may be distinguished not only by the greater length of the tail but also, if in summer pelage, by the absence of yellow from the under side of the tail and inner sides of the hind feet, which parts in cicognanii usually show more or less yellow.

"Measurements.--Average of 10 males: Total length, 407 [15.89 in.]; tail vertebrae, 140 [5.47 in.]; hind foot, 47 [1.83 in.]. Average of 10 females: Total length, 324 [12.65 in.]; tail vertebrae, 108 [4.22 in.]; hind foot, 34.5 [1.35 in.]." (Merriam, 1896:17-18).

Range in Maine:

For the Portland region, Mr. Norton (1930:26) writes: "This species is less frequently found than the Bonaparte's ..."

Pope mentions only one record for Brunswick.

G. M. Allen (1904:26) gives the Maine range of this species as:

"Southern half. Upton."

According to Seton's map (1929, II:615), prepared with the assistance of the Biological Survey, long-tailed weasels range throughout Maine and eastward through New Brunswick and Nova Scotia.

Dutcher did not report any long-tails from Katahdin.

Life History:

"The various kinds of weasels in this country are much alike in their habits, and there is probably as much difference to be observed between the ways of individuals of each species as between the different species. . . .

"They hunt tirelessly, following their prey by scent, and kill for the mere joy of killing, often leaving their victims uneaten and hurrying on for more; when game is abundant they content themselves with sucking the warm blood. In cold weather they frequently hide the game they are unable to eat as a provision against periods of hunger."

"Meadow-mice, moles, shrews, and the common mice and rats of barns and corn ricks, are also hunted by the weasel, but where white-footed mice are abundant they are pretty certain to receive his first attention."

"In summer they catch grasshoppers, crickets, and beetles of various sorts, and rob every bird's nest they find. Ground-feeding birds are especially liable to be caught by them, and they have even been seen to spring into the air and catch birds on the wing."

"The larger kinds, including the ermine or long-tailed weasel and Bonaparte's weasel, appear to be the most savage and bloodthirsty; the New York and the least weasel, from what I can learn, are somewhat more civilized in their ways. A New York weasel which I kept in captivity for a few days was gentle and docile from the very first, and perfectly fearless."

"The weasels of the Northern States and Canada turn white at the approach of winter. The end of the tail, however, does not change color, but remains perfectly black as in the summer."

"Weasels make their homes under stumps and in the hollow roots of old trees, or else they take possession of the burrows of ground-squirrels, often having killed the original occupants."

Weasels travel by silent gliding leaps, ofter covering several yards at a bound, their hind feet falling exactly in

the tracks of the front ones. Their footprints in the snow are close together in pairs, one foot slightly in advance, and the pairs separated by intervals of from one to ten feet or more. In soft snow their slender bodies leave their impress from one pair of footprints to the next.

"They are great wanderers, traveling miles in a single night, and frequently being gone on long hunts for weeks together." (Stone and Cram, 1904:236-239).

"The female weasel has from four to six or even eight young at a birth and the mother is absolutely fearless in protecting her litter." (Anthony, 1928:107).

The nest and young of cicognanii have been described by Bishop (1923), who mentions a mane-like development of the fur on the top of the head and neck, apparently not heretofore described.

Seton (1928, II:631) quotes an account by J. Dewey Soper of a hawk that had carried a weasel aloft, where the hawk was killed and came tumbling earthward bringing its assailant with it.

Mr. J. W. Alexander of Brunswick and Harpswell, who is now eighty-four years old, tells of having seen an eagle die in the same fashion. Mr. Alexander was hunting along a wooded shore at Harpswell and had stopped to rest for a few moments at the time when he saw an eagle swoop downward to earth, then rise higher and higher. Something about the manner of flight attracted the observer's attention, so he watched it until it had risen almost to the limit of visibility, when it suddenly folded up and came hurtling earthward. A weasel was still held in one of the eagle's claws when the observer reached the victim, but the bird had been unable to keep the beast from killing it.

Mr. Alexander has been a life-long hunter and is a careful observer. Because of the added fact that he is not familiar with such accounts in the literature of mammalogy, the writer has not the slightest reason to doubt his words.

Economic Status:

Weasels are trapped quite extensively for their fur when it is white in the winter. No distinction is made between the species by the fur dealers, except that the larger ones command a better price.

Weasels are valuable in controlling mice and rats; just how much they offset this value by eating beneficial creatures, such as certain species of birds, is not known.

The average annual catch of weasels, reported by Maine trappers, as computed for the eight-year period of 1928-1935, inclusive, was 5,611 pelts.

Mustela occisor (Bangs). Northern Long-tailed Weasel.

General Description:

Very large and long-tailed. Tail not as broad as in noveboracensis and black tip very restricted. Color pattern much as in noveboracensis. Total length, males, 18 inches [461 m.m.], females, 13.5 inches [336 m.m.]; tail vertebrae, males, 7 inches [179 m.m.]; females, 4.5 inches [115 m.m.]; hind foot, males, 2.1 inches [54 m.m.], females, 1.6 inches [41 m.m.]." (Anthony, 1928:103).

The status of this form is not yet fully established.

Bangs, when describing this type (1899:54-56), made the following remarks:

"I am still in doubt whether P. occisor is a distinct species or a highly differentiated northern race of P. noveboracensis. Summer specimens may show color differences; but with only white winter specimens one must rely wholly upon cranial characters and differences in proportions, and, I must confess that some youngish examples are troublesome, and in one or two cases I am in doubt whether to place the specimen with P. occisor or with P. noveboracensis. There is, however, no trouble in telling the large, adult examples - the immensely long, narrow tail of P. occisor, with its short black end, the large size of the animal, and the cranial characters pointed out above, distinguishing it at once from P. noveboracensis. The largest males of P. occisor are equal in size to P. longicauda, and sometimes even exceed that species in length of tail. The female, however, is much smaller than the female of P. longicauda, and the skull shows that the real affinity of P. occisor lies with the noveboracensis, and not with the longicauda, series.

"The distribution of this new weasel is undoubtedly rather northern, but is still imperfectly known. Besides the Bucksport series I have two males, both in white winter dress, from Moosehead Lake, Maine. I now believe that the "trapper's" skin, without skull, bot by Mr. Gerrit S. Miller, Jr., at North Bay, Ontario, and at that time identified by me as P. longicauda spadix, may in reality be an example of P. occisor. Dr. C. Hart Merriam also has written me that there is a skin from Manitoba, apparently of this species, in the Biological Survey Collection at Washington.

"All specimens I have seen from northern Massachusetts and southern New Hampshire are extreme P. noveboracensis, and I have one undoubted example of that form from Upton, Maine."

Seton (1929, II:614) speaks of six so-called species of long-tailed weasels, including occisor, in the following words:

"The last 6 have usually been considered to form one species, noveboracensis."

Range in Maine:

Known from but few localities, most of which are cited by Bangs in the above quotation from his paper.

Life History:

See Mustela noveboracensis.

Economic Status:

See noveboracensis.

Mustela vison vison Schreber. Little Black Mink; Eastern Mink.

General Description:

"A large weasel-like mammal nearly as large as a small House-cat but much more slender. Body elongate and supple; head subtriangular viewed from above; ears small; neck long; legs short; tail about half as long as head and body, moderately bushy; feet with five toes; pelage composed of soft underfur more or less concealed by long, glistening guard-hairs; color dark, glossy brown; anal musk-gland well developed; semi-aquatic in habit; alert and active in behavior.

"Color.--Sexes colored alike; no noticeable seasonal variation.

"Upperparts a uniform dark umber-brown, rich and glossy in appearance, slightly darker along back and tail; underparts like upperparts except for white area on chin and irregular white spots which may be scattered anywhere.

"Immature pelage not quite as dark as adults, and lacking most of the long, hard, outer hairs." (Anthony, 1928:107-108).

"Subspecific characters.--Smallest of the American minks; colors dark. Skull small and comparatively weak and smooth, without well-developed sagittal crest; teeth small." (Hollister, 1913:472).

Measurements.--"Smaller size (males length 20.50 inches [525 m.m.], tail 7.00 [179 m.m.], foot 2.37 [61 m.m.] or less; females 1950 [499 m.m.], 5.75 [147 m.m.], 2.00 [51 m.m.] or less), and skull without sagittal crest, appear to be the best characters separating this from the next subspecies." (Norton, 1930:27).

Range in Maine:

Within this state this is the inland form.

"Not found on the coast south of New Brunswick." (Hollister, loc. cit.).

"A specimen in the collection of the Portland society of Natural History was taken in Westbrook (six miles inland), July 16, 1897. . . . Pope considered this the "common mink in Brunswick" and mentioned the taking of a specimen on Mere Brook in March, 1905. . . ." (Norton, loc. cit.).

Dutcher's observations (1903:70) at Katahdin are as follows:

"Mink are common and range up to timber line. On August 26, I caught an adult specimen at an altitude of 3200 feet, 1700 feet above, and five miles beyond, the upper limit of fish-inhabited waters. Heavy rains had filled a usually dry water course in the upper part of the middle basin, and he had probably followed this up."

Life History:

"The American mink is one of the most valuable members of the weasel family and is widely known for its fur. It is long-bodied and attains a weight of from 1½ to more than 2 pounds. The legs are short, and the animal travels with the back arched, in a series of easy bounds, which it appears able to continue tirelessly.

"Minks are bold and courageous and in the wild attack and kill for food species heavier than themselves, such as the varying hare and the muskrat. They eat mice, rats, chipmunks, squirrels, and birds and birds' eggs of many kinds, including waterfowl and other ground-frequenting species. Along water fronts they capture fish of different species, which they pursue

in the water, and vary this diet with one of snakes, frogs, salamanders, insects, crustaceans, and mussels." (Ashbrook, 1927:1-2).

"The mating season of minks occurs principally during March, and occasionally in the latter part of February. The oestrum, or heat period, occurs once a year. Its length is not definitely known. . . . The gestation period is approximately 45 to 50 days, although cases have been known in which the young were carried as long as 60 days. . . ." (Ibid., 3).

Clapp wrote in 1868 (p.656):

"The Mink is a sly, thievish creature. They eat fish and frogs. I have seen where they brought the frogs in to their young. The nest was under the roots of a tree."

"Mink dens are located wherever a safe and convenient shelter is available, and may be a hole in a bank, made by a muskrat or other animal, a cavity under the roots of a tree, a hollow log, a hollow stump, or other place. The nest is made of grass and leaves lined with feathers, hair, and other soft material. A single litter of from four to twelve small and naked young is born during April or May.

"The young remain with the mother throughout the summer, and do not leave her to establish themselves until fall, when they are nearly grown. . . ." (Nelson, 1918:473).

"While minks are not social animals, they are, I am certain, much less in the way of putting up pitched battles when they meet than are the majority of woodland folk. Sometimes half a dozen or more old males will gather about some particularly good fishing hole and to all appearances get along perfectly together for weeks.

"In winter, when the still waters are frozen, they haunt open rapids and warm springs in the woods, or finding entrance beneath the ice of a closed brook, make extended excursions along the dim buried channel, alternately running beneath the ice and along the brook's border where the falling away of the water has left a narrow strip of unfrozen turf beneath ice and snow. Here they catch small fish and meadow mice, or, tracing the brook's course down to the wider reaches of the river, find larger fish and muskrats to try their strength upon. Water, however, is not essential to the mink's happiness at any season, for they can hunt rabbits all winter long in the snow as successfully as the sable or fisher." (Stone and Cram, 1904:235).

Economic Status:

Henry Clapp, of Brownville, Piscataquis County, writing in 1868 - shortly after the Civil War - stated (p.656):

"We catch them in both 'dead-falls' and steel-traps, baited with fresh fish; though they will take also muskrat, partridge, and red squirrels. They are not very plenty about here. Their skins are worth $5.00 to $6.00."

Since 1927, the number of mink, taken annually, by Maine trappers ~~is~~ has been as follows:

1928 - 3,502	1932 - 3,284
1929 - 3,193	1933 - 3,646
1930 - 2,110	1934 - 3,986
1931 - 4,398	1935 - 3,280

Mustela vison mink (Peale and Beauvois). Common Mink; Big Brown Mink.

General Description:

"Subspecific characters.--Larger and more generally robust than M. v. vison. . . Coloration averaging much as in vision, possibly slightly darker. . . " (Hollister, 1913:473).

"This is a larger, heavier built animal (males about 24.75 [631 m.m.], 8.25 [211 m.m.], 2.75 [70 m.m.]; females about 20.00 [512 m.m.], 6.75 [173 m.m.], 2.25 [58 m.m.] or more), and the skull has a pronounced sagittal crest to distinguish it from Mustela vison vison." (Norton, 1930:37).

Range in Maine:

A maritime race in the northeast (coastwise at least to Washington County, Maine), but its range extends inland south of New York.

For New England, Dr. G. M. Allen (1904:25) states:

"On the seaboard, and rocky islands off shore."

For Maine the same author mentions:

"Flatt Island, off Jonesport."

For Brunswick, Pope (1922:82) states:

"The large brown mink doubtless occurs along the coast here as several trappers told of taking it and distinguished it clearly from the little black mink."

Brunswick is within the area included by Norton (1930: 27) when he states that:

"The Portland region is well within the recorded range of this subspecies."

Life History:

See the account of M. v. vison, of which the present animal is but a maritime race within our borders.

Economic Status:

See the account under typical vison.

The larger skins of this animal, all else being equal, command a better price.

Mustela macrodon (Prentiss). Ancient or Big Sea Mink. Sea Mink.

This very large mink, which has been extinct for about forty years, formerly occurred coastwise in eastern Maine and western New Brunswick. It is known only from skeletal material secured mainly from Indian shell-heaps, and a mounted specimen, probably of this species, taken at Campobello Island, New Brunswick, about 1894. This specimen is in the collection of Clarence H. Clark, of Lubec, Maine.

See also: Seton, 1921; Seton, 1929; Norton, 1930:27-32.

Subfamily Guloninae

Gulo luscus (Linnaeus). Wolverine; Glutton.

General Description:

"A sturdy, long-haired member of the Weasel family of which it is the largest. Head broad and powerful; ears short; form robust and bear-like; legs sturdy; toes five on fore-

and hind feet; claws large and curved, semi-retractile; soles hairy; semiplantigrade; tail fairly long, heavy and bushy; pelage long and thick; color pattern dark brown with broad, light, lateral band." (Anthony, 1928:111-112).

Measurements.--Males slightly larger than females. Total length, males, 41 inches [1050 m.m.], females, 37 inches [947 m.m.]; tail vertebrae, males, 8.5 inches [218 m.m.], females, 7.2 inches [184 m.m.]; hind foot, males, 8 inches [205 m.m.], females, 7 inches [179 m.m.]; weight, males, 30-35 pounds, females, 22-27 pounds." (Ibid., 112).

Range in Maine:

Probably now extirpated.

Seton (1929, II:377) has a map, prepared "with the assistance of the Biological Survey," which has the upper two thirds of Maine shaded as being within the former range of the wolverine.

For Maine, G. M. Allen (1904:25) states:

"Norway (about 1865)."

Seton (op. cit., 411) begins his list of United States records for this species thus:

"Those for New England are as follows: Maine (Bachman)..."*

Under the heading of "April 3, 1844", in Volume I of the Proceedings of the Boston Society of Natural History, there is listed a "Donation to the Cabinet:"

"Skin of a Wolverene, taken on the Fish River, near Houlton, Maine, from Major Townsend, U. S. Army."

While there seems no reason to question the authenticity of this record, it might be well to add that the present writer has been informed that the present whereabouts of this wolverine skin is unknown.

Dutcher (1903:69), in his article on mammals of Katahdin, wrote:

"The trappers all denied having seen or heard of the wolverine in the region, though they were acquainted with the animal by repute."

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* The present writer has not seen Bachman's statement.

Mr. Norton has told me that Mr. Roy Dudley reported seeing a wolverine trail last winter (1935-36) in the vicinity of Hunt Mountain. I am presenting this statement for what it is worth, but before passing judgment on it, it might be well to bear in mind the following published report for New Hampshire, by C. F. Jackson (1922:13):

"A second unusual species is the wolverine, a pair of which were found in 1918 in the Diamond region east of Connecticut Lakes. Two young animals were taken, which would lead one to believe that the species was breeding to a certain extent within this wild region."

In the questionnaires, sent out by the Wild Life Station at the State University, a few wardens from various districts reported 'rumors' of this animal having been present in the quite distant past.

Life History and Economic Status:

At the present time the life history, etc. of this species is of no consequence in Maine, so it need not be discussed here.

Subfamily Lutrinae

Lutra canadensis canadensis (Schreber). Otter.

General Description:

"A long, lithe-bodied carnivore, of weasel-like form, with webbed feet, and long tail. Size large; head rather broad and flat; body long and proportionately slender; legs short; fore- and hind feet with five toes, soles hairy, forefeet webbed; tail long and tapering, pelage very dense and composed of thick, short underfur and long, glistening guard-hairs; habit more or less aquatic.

"Color.--Sexes colored alike; no very marked seasonal variation in color.

"Upperparts uniform glossy brown, dark and rich in tone, grayish on lips and cheeks; underparts lighter than upperparts, with grayish tinge.

"Measurements.--Total length, 40-45 inches [1024-1152 m.m.]; tail vertebrae, 12.5-15 inches [320-384 m.m.]; hind foot, 4-4.7

inches [102-120 m.m.] Weight from 18 to 25 pounds, about 20 being average." (Anthony, 1928:114-115).

Range in Maine:

The otter seems to be still taken in every county in the State, although, of course, it is much less frequent in the more thickly populated areas.

Life History:

Henry Clapp, of Brownville, (1868:656-657) wrote thus:

"I estimate the weight of a good-sized Otter at thirty pounds; their average weight is twenty-five to thirty pounds. They live on fish and muskrat. They dive down, and then rise into the passage way of the muskrat house, so as to push their jaws into the house and catch the muskrat, unless, as is sometimes the case, the muskrat has a second passage to escape through. The otter has no house, but lives in holes in the banks of streams, and in hollow logs, and under roots. His hind-foot is partially webbed; I don't remember about his fore-foot. He dives and chases fish under water. I saw one do this, and then shot him. He seems to like to slide instead of walking down a slope. He seems to have certain places for voiding his excrement. Color, dark-brown or black. Legs very short; body and tail very long. He is a roving animal. . . ."

The following passages, from the writings of Manly Hardy,* of Brewer, are quoted from Seton (1929, II):

"Otters seldom stay more than a few days in one place, no matter how plentiful the fish are. The Indians say: 'Otter don't happy in Heaven'.

"A family will have a route which they will follow as regularly as a Methodist circuit rider. Sometimes it will be only 15 or 20 miles but oftener twice as much; which round they will make in from 2 to 4 weeks, going through chains of ponds, up or down streams, and sometimes making carries on land for quite long distances, sometimes meeting others, but oftener one party coming into a pond soon after another has left. When one

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* Hardy's article on "The Otter" appeared in Forest and Stream, March 4th and 11th, 1911. The present writer does not have access to a file of this magazine, but the page references, taken from Seton, are to the pages in Hardy's original article.

sees tracks of Otters leaving the water and going overland, he may be sure that they are taking the shortest route to some other water." (p.372).

"Besides fish they often catch Muskrats, and in winter I have known them to entirely depopulate the houses of a large colony of Muskrats. When in a Beaver country, they often kill the young Beaver, and I feel quite sure that they also sometimes kill ducks.

"I was once being paddled up to a black duck when we had heard quacking in a logan; I saw what I thought were the backs of several ducks, and beyond them, just then a duck gave a loud quack and flew. I then saw that what I had taken for ducks were two Otters which seemed to be trying to catch the farthest duck. While they were under water, I put a charge of BBs in one barrel, and on their rising with their heads close together, I killed one and wounded the other. The same fall, the man who was paddling me on this occasion, saw two Otter trying to catch some wood ducks." (p.371).

"While they feed on trout where trout are plentiful, Otters also eat all kinds of coarser fish - chubs, suckers, and horned pouts. I have several times seen them eating eels, which they seem to prefer to anything else. Sometimes when fish are plentiful and easy to catch, the Otter will kill them for sport, just as too many of our visiting fishermen do. I have known one to pile up a large lot of suckers which he had caught for the fun of it." (Ibid.).

"In places where the snow drifts deep over the banks on the edges of streams or ponds, they often have places under the snow banks where they bring out their fish and eat them." (p.372).

"While not gregarious in the sense of collecting in large numbers, still I know of no other of our fur-bearing animals, except the Beaver, which is so seldom seen solitary; and no other, not excepting Squirrels, which spend so much time playing together. Two or three are seen together as commonly as one is seen alone. Often 4 or 5 are seen in company, and I have known of 7." (p.330)

"Sometimes when attacked, they give a sharp scream, somewhat like the scream of a Mink, only much louder. This and the noise they make when they are calling each other, are the only noises I have ever heard of their making, except that I have heard of one snoring when asleep; and when one rises out of the water and smells a person, he will snort or blow very much as a seal does." (ibid.).

Hardy speaks of finding a three-legged Otter that had a den "in a hollow log with two young. She had a nest made of

shredded cedar bark. I have known of their having dens in ledges, but this is the only instance I know of one's denning in a log." (p.372).

"Usually Otters have but 2 young, but I have known of their having 3. Some writers speak of more, but I very much doubt their having more than 3." (ibid.).

"While most animals occasionally quarrel with each other, I have never heard of Otters being seen fighting together, and in handling some thousands of their skins, I have never seen any evidence of their biting one another." (p.371).

Hardy (p.372) mentions handling about 5,000 skins of this animal during 60 years' experience. Five, taken in a limited area were white; he had also heard of three other albinos.

Economic Status:

A valuable fur-bearer.

According to Henry Clapp, their skins in Maine sold for from $6.00 to $8.00 prior to 1868.

The average annual catch of Otters reported by Maine trappers, as computed for the eight-year period of 1928-1935, inclusive, was 151 pelts.

Subfamily Mephitinae

Mephitis nigra (Peale and Beauvois). Eastern Skunk; "Polecat."

General Description:

"A heavy-bodied, black and white mammal, with large bushy tail, and well-developed scent-glands capable of forcibly discharging fluid of penetrating and disagreeable odor. Head proportionately small; body robust, about size of House-cat; legs short; tail large and bushy; feet semiplantigrade; claws of fore-feet well developed for digging; pelage composed of long, hard hairs over a short, soft underfur; color pattern conspicuous black and white; nocturnal and crepuscular in habit, but sometimes may be seen about in daytime; slow-moving and deliberate in behavior." (Anthony, 1928:126).

"Total length, males 24 inches [614 m.m.], females, 23 inches [589 m.m.]; tail vertebrae, males, 9 inches [230 m.m.], females, 9 inches; hind foot, males, 2.5 inches [64 m.m.], females, 2.4 inches [61 m.m.]." (Ibid., 237).

"In the present species, Mephitis nigra, the tail is more than half the length of the body and head, long penciled, and the palate has distinct tubercles posteriorly." (Norton, 1930: 34).

Range in Maine:

In suitable localities throughout the state.

A. H. Howell (1901:27) lists a specimen from Bucksport and two from Brooklin.

Life History:

"Skunks are most common in areas of mixed woodland and fields, in valley bottoms, and along the brushy borders of creeks and rocky canyons. One of their marked characteristics is a fondness for the vicinity of man. They frequently visit his premises, taking up quarters beneath outbuildings or even under the house itself.

"Any convenient shelter appears to satisfy them for a home, and they will occupy the deserted burrows of other animals, small cavities among the rocks, a hollow log, or a hole dug by themselves. A warm nest of grass and leaves is made at the end of the den, where the single litter of young, containing from four to ten, is born in April or May. As soon as the young are old enough they follow the mother, keeping close behind her, often in a long single file along a trail. They are mainly nocturnal, but in summer the mother frequently starts out on an excursion with her young an hour or two before sunset and they remain abroad all night.

"The young family remains united through the following winter, which accounts for finding at times from eight to a dozen in a den. In all the northern parts of their range they hibernate during the two to four months of severest cold weather, coming out sometimes during mild periods. When the season of hibernation ends the family scatters and mating begins. . . ." (Nelson, 1918:477).

The skunk is nearly an omnivorous eater. For a very extensive study of its food habits in New York state, see Hamilton, 1936:240-246.

Economic Status:

In 1914, Lantz (p.14) wrote as follows:

"The skunk stands second in importance among the fur animals of the United States, the total value of the annual catch being exceeded only in the case of the muskrat. The mink is third in value. Most of the skunk skins are marketed in London, but their use is increasing in the United States and a small percentage is now dressed and made up here."

Henry Clapp of Brownville wrote, in 1868, (p.357):

"They are plenty about here. The skin is worth ten to fifteen cents, and has been worth fifty cents. . . ."

The skunk undoubtedly serves a beneficial function in destroying noxious insects.

The average annual catch of skunks reported by Maine trappers, as computed over the eight-year period of 1928-1935, inclusive, was 5,374 pelts.

Family Canidae

Subfamily Caninae

Vulpes fulva (Desmarest). Eastern Red Fox; Cross Fox; Black Fox; Silver Fox.

General Description:

"Resembling a small, sharp-nosed Dog of slender build; ears large and erect; pupil of eye linear; muzzle long and slender; tail long and bushy; claws fairly long and sharp; pelage long and soft.

"Color.--Sexes colored alike; slight seasonal variation; occurring also in several color phases.

"Upperparts.--Bright golden yellowish, slightly darker along mid-dorsal region, rump grizzled lightly with whitish; head reddish yellow, grizzled with whitish; forefeet to elbow black; hind feet black; tail yellowish, mixed with black, a dark spot on upper surface near base, tip white.

"Underparts.--White.

"Immature have blackish on muzzle and back of ears; dusky on head and tail; very young dull yellowish brown or drab in color.

"Measurements.--Males larger than females. Total length, 41 inches [1050 m.m.]; tail vertebrae, 16 inches [410 m.m.];

hind foot, 6.5 inches [166 m.m.]." (Anthony, 1928:138).

See also Merriam, 1900.

Range in Maine:

The red fox is quite common throughout the entire state. It occurs on a number of the larger islands along the coast.

Life History:

"Red foxes apparently pair for life and occupy dens dug by themselves in a secluded knoll or among rocks. These dens, which are sometimes occupied for years in succession, always have two or more entrances opening in opposite directions, so that an enemy entering on one side may be readily eluded. The young, numbering up to eight or nine, are tenderly cared for by both parents." (Nelson, 1916:417).

"The period of gestation is now known to be 51 days, without more than 12 hours' variation." (Seton, 1921, I:519).

In "Following Fox Trails,"* Adolph Murie has given an account of the activities, from January to August, or a pair of wild red foxes in Michigan.

Economic Status:

Regarding the red fox in southwestern Maine, Norton (1920: 35) writes as follows:

"The fox is an inverterate hunter of field mice, and is undoubtedly a most important factor in the control of this very prolific and destructive rodent. It also helps to hold in check any undue increase in the numbers of hares and rabbits. Its extermination would be most unfortunate. Yet through its fondness for poultry, and its extreme cunning in eluding measures of retaliation, it has until recently been outlawed from the protection accorded other fur bearing animals in this state."

Hamilton (1935) has written on the food of red foxes in New York and southern New England.

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* Misc. Pub. No. 32, Univ. of Michigan, Museum of Zoology, Aug. 7, 1936. Pp. 1-45, 6 plates, diagrams.

Over an eight-year period, the average annual catch of foxes, as reported by Maine trappers, has been 4,901 pelts. These were distributed annually as follows:

1928 - 6,236	1932 - 3,229
1929 - 3,330	1933 - 3,987
1930 - 1,660	1934 - 5,715
1931 - 5,168	1935 - 6,282

Urocyon cinereoargenteus borealis Merriam. Northern Gray Fox.

Because this animal is a species of the past in this State and probably will not again occur within our borders, a description of it will not be given here.

Range in Maine:

Norton (1930:36-38) refers to statements made by several writers which would indicate that the gray fox ranged into Maine in earlier times. He concludes (page 38) thus:

"The evident fact that it was abundant in the northern parts of its range in early times, that Audubon and Bachman understood that it reached the state of Maine, and that Josselyn was apparently familiar with it, suggests that it may have occurred in the vicinity of Black Point.

"A careful examination of the shell-heaps of southwestern Maine should be made with the possibility in view of establishing the former occurrence of this animal here."

Seton (1929, I:576) states thus:

"On the other hand, there is some evidence that its northward range has shrunken. . . ."

In his "Notes on New Hampshire Mammals," C. F. Jackson (1922:14) writes as follows about this species:

"In regard to the northern gray fox, the only record which I have is that of the type specimen described by Merriam in 1903, which was taken at Marlboro, New Hampshire. . . ."

Here, then, is a species that has withdrawn from a large area of the periphiral section of its northern range since the colonization of New England by Europeans.

Canis lupus lycaon* Schreber. Eastern Timber Wolf.

As the wolf is extirpated in Maine, a description of the animal will not be included here.

Range in Maine:

Formerly the wolf was found throughout the State. "Of all the wild animals, this was the most troublesome to the early settlers and seems to have been one of the most wary and sagacious . . . ." (Norton, 1930:41-42).

The same writer (ibid., 45) quotes a statement to the effect that the last wolf killed in the Portland region was taken "some time, and perhaps many years, prior to 1850. . . ."

Henry Clapp, of Brownville, Piscataquis County, wrote as follows (1868:653):

"I know little about wolves. I have seen them, but never killed one. . . ."

Wolves certainly were not numerous anywhere within our boundaries at the time Clapp's statement appeared in print.

The last wolf taken in New Hampshire was killed in the White Mountains in 1887 (C. F. Jackson, 1922:14).

G. M. Allen (1904:23) wrote that wolves were "practically extirpated" in Maine.

Seton (1929, I:265) stated thus:

"In Maine the Wolf is extinct."

We have only to add to this that no twentieth century report of the killing of a wolf in Maine has proved reliable upon investigation.

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* Probably this name, rather than Canis lycaon, will stand in the future. See "The Wolves of North America," by A. E. Goldman. Journal of Mammalogy, Vol. 18, No. 1, pp.37-45. February, 1937.

Life History and Economic Status:

See Seton (1929, I, part 1:251-337) for a complete account of this animal.

See also Norton (1930:41-48) for an interesting account of the wolf in the Portland region.

The matter of wolf bounties will not be discussed here as Norton (loc. cit.) has devoted considerable space to it.

Family Felidae (Cats)

Felis couguar Kerr. Cougar; Panther; Catamount; Mountain Lion.

General Description:

"Largest of the New World unspotted cats; head proportionately rather small; body long and lithe; tail long and cylindrical; five toes on forefeet, four on hind feet, each with a long, sharp, retractile claw; gait digitigrade; ears well developed, not tufted; pelage soft and rather short; color brownish. . . .

"Color.--Sexes colored alike; no marked seasonal variation.

"Upperparts dull yellowish brown or tawny; ears blackish posteriorly and light-colored internally; tail like back, dark brown at tip; underparts paler than upperparts.

"Immature yellowish brown spotted with blackish.

"Measurements.--Males larger than females. Males, total length, about 96 inches; tail vertebrae, about 24-30 inches; hind foot, 10 inches; weight, about 150 pounds. Females about 12 inches shorter in total length." (Anthony, 1928:157).

Range in Maine:

Formerly, probably of rare occurrence throughout the State.

A number of recorded occurrences are here mentioned.

Norton (1930:49-51) records "two detailed accounts of the occurrence of this animal" in the Portland region. The earlier of the two is for Sebago and dates "about 1845." The later is for Baldwin and, while no date is given, it was first recorded in 1895 - Ridlon, Saco Valley Settlements, I, 402-403.

Seton (1929, I:53) mentions the later record cited by Norton and adds an occurrence at Norcross, based on an account in Forest and Stream, June 27, 1908, 1011-1012. Regarding this latter occurrence, Seton writes as follows:

"Norcross. Charles H. Daisey, the well-known guide of Camp Phoenix on Sourdnahunk Lake, about 50 miles from Norcross, was coming to the latter place early in the fall of 1907, when he met two Panthers and wounded one with his revolver, but it got away. He saw their track before and after the encounter and has no doubt that they were Panthers.

"A Panther was seen in the neighborhood later in the season by Frank Haskell, who followed the track a long way, accompanied by Capt. Robert Sawyer, but nothing further was seen ofthe animal."

Seton also refers to C. F. Jackson's article on New Hampshire mammals in which the latter mentions (1922:13) what appears to be the latest recorded killing of a panther in Maine. Jackson writes thus:

"Perhaps the most interesting discovery is that a pair of cougars whose range extends along the east side of the Androscoggin River in the town of Cambridge New Hampshire to the southern shores of Lake Umbagog. Records of the occurrence of this species in recent years are very meager. For the southern part of the state below the White Mountains, the latest record I can find is that of a large male which was shot near Epping New Hampshire, in 1870. In 1885 a specimen was taken in the White Mountains which is the latest record I have for the state. Rumors have been heard from time to time of the cougar occurring in Maine and in the Green Mountains of Vermont.

"Dr. E. W. Nelson of the Biological Survey has referred me to two records, one from Vermont and one from Maine. The latest Vermont record is furnished by Merriam in the Proceedings of the Washington Academy of Sciences (volume III, 1901, p.582). According to this record the last one killed was in 1894. In the same letter Doctor Nelson referred me to The American Field (volume 66, p.400) which cites the killing of a panther in Maine near Mount Kineo in 1906.

"It would seem that the species has been able to survive in the less frequented portions of Maine."

Life History:

"The Cougar has many of the attributes of the small House-cat and, like it, is said to be exceedingly playful. The scream of the Cougar is a long, drawn-out cry, weird and startling,

well calculated to raise the hair of the timid. The observations of many naturalists indicate that this animal has a variety of screams, cater-waulings, and yells, some of which are terrific.

"The Cougar is active throughout the year and does not den up in the winter. The home den is usually in a cave or fissure in the rocks, but, if these are not available, it may be in a dense vegetation. The young are usually two in a litter, but the number varies from one to five. They are generally born in late winter or early spring, but may be born in any month of the year." (Anthony, 1928:160-161).

Economic Status:

This species probably never existed in Maine in sufficient numbers for it to have any economic significance, either directly or indirectly.

Lynx canadensis canadensis Kerr. Canada Lynx; "Loup-cervier;"

General Description:

"A good-sized Cat with prominent, tufted ears; very short tail; long limbs; large, broad feet; and rather long, loose pelage.

"Color.--Sexes colored alike; marked seasonal variation and considerable individual variation.

"Upperparts.--Grizzled gray, brown, and blackish; the pelage pale drab at base, then buffy brown and finally tipped with light gray, dark brown, or blackish; nose and cheeks grayish; crown brownish; ears inside grayish white, edged with buff, a gray spot on posterior surface; apex of ear, tuft, and lines down margin of ear black; ruff about throat, mixed blackish, dark brown, and gray; tail brownish, tipped with black; sides and limbs lighter and warmer in tone than back.

"Underparts.--Mixed grayish and light buffy brown, with occasional irregular blotches of blackish.

"The above is for November skins in fresh pelage; summer pelage is browner and when worn and ragged, as in late summer, most of the colored tips of the hairs are missing and the buffy basal pelage predominates.

"Immature spotted and streaked with brown and blackish upon a light fawn ground color.

"Measurements.--Males larger than females. Total length of males, 36-39 inches [922-998 m.m.] ; tail vertebrae, 4 inches [102 m.m.] ; hind foot, 9.5 inches [243 m.m.] ; weight, 20-25 pounds, a recorded maximum weight of 44 pounds." (Anthony, 1928:165-166).

Range in Maine:

Apparently since colonization this animal has not been known to occur in extreme southwestern Maine. (See Norton, 1930:51). It is still to be found over the upper half of the State.

Life History:

"The Canada lynx has from two to five kittens, which are marked with dusky spots and short bands, indicating an ancestral relationship to animals similar to the ocelot, or tiger-cat, of the American tropics. The young usually keep with the mother for nearly a year...." (Nelson, 1918:409).

Economic Status:

The Canada lynx has a varied diet, consisting of all creatures wearing fur or feathers which it is capable of killing. Hares, undoubtedly, constitute the major portion of their diet.

Manly Hardy (Forest and Stream, July 27, 1907:131) tells of finding a mink which a lynx had killed, but the cat had continued on its way without eating its victim. Thus, they apparently occasionally kill animals which they do not eat.

Because lynxes are very capable of killing deer and other game, the deer particularly during the winter months, there has been a bounty on the "wild cat," intermittently, since 1832. As most of the "wild cats" taken are smaller bay lynxes, an account of the numbers of lynxes on which bounties have been paid will be given in the discussion on economic status of that more abundant animal.

Lynx rufus rufus (Schreber). Bay Lynx; Red Lynx; Bobcat; Wild Cat.

General Description:

"Like Lynx canadensis in general appearance but feet much smaller, ears but slightly or not at all tufted, tail not black all around at tip; pelage brownish and spotted instead of pale grizzled gray; hair not as long. Upperparts variable but usually mixed buff and brown spotted and lined with black or brownish black, darkest along dorsal region; sides of legs lighter and buffier; crown streaked with black; ear marked heavily with black on posterior side, with large gray spot; black tuft on ear small; tail above like back, tipped with black, below like belly and without black tip; underparts whitish, washed with buffy on neck, and heavily spotted with black; ruff on chin small. Paler in winter than in summer. Total length, 36 inches [922 m.m.]; tail vertebrae, 7 inches [179 m.m.]; hind foot, 7 inches [179 m.m.] .... " (Anthony, 1928:166-167).

Range in Maine:

Formerly this animal was probably rather common throughout the entire State, but at present it is practically extirpated in thickly settled areas. (Norton, 1930:52-54) mentions a number of occurrences of the bay lynx in the Portland region since 1900.

Life History:

The life history of the bobcat does not differ greatly from that of the lynx.

According to Anthony (1928:169), this animal has two to four young and they are born in April or May.

Economic Status:

A bounty has been paid on this animal, intermittently, over a long period of time. The bounty years and the amount of the bounty has been as follows:

1832-1933. . .	$1.00	1919-1930 . . .	$10.00
1897-1898. . .	2.00	1931-1932 . . .	20.00
1899-1900. . .	5.00	1933-1934 . . .	10.00
1900-1912... .	2.00	1935-date . . .	15.00
1913-1918. . .	4.00		

In a period of four years (July 1, 1932 to June 30, 1936) bounty was paid on a total of 3,255 bobcats in Maine. None were taken in Androscoggin, Cumberland, or Lincoln Counties; one was taken in Knox, one in Sagadahoc, and two in Waldo County. Of the remaining counties the percentage taken in each county is as follows:

Aroostook	25.80%	Hancock	6.47%
Piscataquis . . .	15.87	Oxford	4.29
Penobscot	14.98	Franklin . . .	3.74
Washington . . .	14.43	York	0.24
Somerset	13.75	Kennebec . . .	0.21

Key to Maine Seals (Order Pinnipedia)

A1 Common.
Length up to 5 feet; color yellowish gray spotted with black. Harbor Seal.....*Phoca vitulina concolor* (P. 74)

A2 Rare.

B1 Length up to 6 feet; usually a band of darker color along each side which meets band from opposite side over shoulders; males 600-800 pounds; females one-quarter smaller. Harp Seal.....*Phoca groenlandica* (P. 75)

B2 Length 7-8 feet; color dark; male with hood on head capable of inflation. Hooded Seal.....*Cystophora cristata* (P. 76)

Order PINNIPEDIA

Family Phocidae (Hair Seals)

Phoca vitulina concolor (DeKay). Harbor Seal; Common Seal; Hair Seal.

General Description:

"A small seal with short limbs and pelage rather coarse and hairy. Head and body typically seal-like; color variable.

"Color.--Sexes colored alike; varying from yellowish gray spotted with dark brown to almost black spotted with yellowish; very young animals are white.

"Measurements.--Sexes of equal size. Total length about 60 inches." (Anthony, 1928:174).

"The Harbor Seal is the common, small Seal found in suitable localities along either coast. In addition to the character of small size, the spotted color pattern is an aid to identification." (Ibid., 175).

Range in Maine:

Coastwise; in varying numbers at dfifferent localities.

Life History:

"All the seals are gregarious, especially during the breeding season, and are migratory to a greater or less extent, the harbour seal being apparently less of a wanderer than the others. The harbour seal is also distinctly a coast species, seldom venturing far to sea, and living and breeding on the exposed rocky ledges along the shore. The others, on the contrary, are found out in the open ocean and frequent the ice floes of the northern seas.

"Young seals at birth are covered with a thick woolly coat, which is later supplanted by the ordinary hair, and until the change occurs they do not take to the water. As a rule, but one young is produced each year; sometimes it is born upon the bare rocks, while in case of the ring seal an excavation is made under the snow communicating with a hole through the ice, and here the young remains for several weeks, tended by the mother." (Stone and Cram, 1904:215).

Regarding the young, Norton (1930:55) writes as follows:

"The young, which are very large at birth, are born from late March to early June, on ledges or secluded shores where the mothers are wont to resort. Definite instances for newly born pups are North Harpswell, March 25, 1928; Scarborough Beach, May 3, 1896; and Arrowsic, June 7, 1924. For a day or two after birth the young are averse to the water."

See also J. A. Allen, 1880: 559-597 for a complete account of the species.

Economic Status:

In his account of the Harbor Seal, Norton (1930:55-58) reviews the legislation on seal bounties and seal protection in Maine. See this extended account for data on the economic status of this species in Maine.

Phoca groenlandica Erxleben. Greenland Seal; Harp Seal; Saddle-back Seal.

General Description:

"Somewhat larger than the Harbor Seal - length up to 72 inches, weight 600-800 pounds for old males, females a quarter smaller - pelage of male bright yellowish, marked with a broad band of brown along side which crosses over shoulders to meet its fellow from the other side; these bands may also meet across lower back; dark brown on head and spots on hind limbs. Females not so clearly marked with brown or lacking brown completely. Young white." (Anthony, 1928:176).

Range in Maine:

Marine; a rare straggler from northern waters.

For the Portland region, Norton (1930:59) states thus:

"Though we have no record of the recent occurrence of this seal in this section, its appearance may be expected as it has been known to range as far to the southwest as the coast of Massachusetts."

Life History:

"Early in February the Seals begin the northern movement, and in March the young are born either off the Straits of

Belle Isle or in the Gulf of St. Lawrence. The young are left on drifting ice-pans, generally not over a few inches in thickness. The old Seals make holes through the ice-sheets by which to come and go. Captain Robert A. Bartlett gives the numbers of Seals in the two main herds as 300,000 in the Gulf of St. Lawrence and 500,000 off Belle Isle, and comments on the ability of the old Seals to find their young after a day's absence when the drift has shifted the ice for several miles. But one young is born to a mother; twins are rare." (Anthony, 1928:177).

See Bartlett, 1927 and J. A. Allen, 1880:630-654.

Economic Status:

Much hunted in the north; too scarce to be of any consequence in Maine.

Cystophora cristata (Erxleben). Hooded Seal; Crested Seal.

General Description:

A fairly large seal, dark in color, having on the top of the head (males only) an inflatable bag of muscular tissue; upperparts slaty black, sides lighter and thickly spotted with whitish; length, 84-96 inches. Young white.

Range in Maine:

Marine; a rare straggler from the north.

For the Portland region, Norton (1930:59) lists three occurrences during the last 60 years.

Life History:

"The Hooded Seal is one of the more abundant Seals of the North Atlantic and ranges over much the same area as the Harp Seal. . . . The two Seals are more or less associated in their migrations and have somewhat similar habits. The Hooded Seal chooses heavier and older ice for the whelping ground, and instead of breaking a hole through shallow sheets of ice it selects ice-hummocks that may be approached from the open sea. This seal does not congregate in large, continuous herds but in small, scattered groups and usually at some distance from herds of Harp Seal.

"The Hooded Seal is more wild and quarrelsome in disposition than the Harp and when angered inflates the hood on the head. The female Hooded Seal usually fights for its young and will die rather than desert it." (Anthony, 1928:177-178).

See also Bartlett, 1927 and J. A. Allen, 1880:724-742.

Economic Status:

Hunted in the north, but too rare to be of any consequence in Maine.

Key to Maine Rodents (Order Rodentia)

A1 Fur with quills. Porcupines. (Family Erethizontidae)
Canada Porcupine.....*Erethizon dorsatum dorsatum* (P.121)

A2 Fur without quills.

B1 Hind legs and tail very long. Jumping Mice. (Family Zapodidae).

C1 Tail tip generally with a few white hairs; belly white; no premolars. Woodland Jumping Mouse.....*Napaeozapus insignis insignis* (P.118)

C2 Tail tip never with white hairs; belly tinged with orange buff; 2 (upper) premolars. Hudson Bay Jumping Mouse.....
.....*Zapus hudsonius hudsonius* (P.115)

B2 Hind legs and tail not noticeably long.

C1 Tail broad, flat and paddle-shaped. Beavers. (Family Castoridae). Canadian Beaver.....
.....*Castor canadensis canadensis* (P. 93)

C2 Tail hairy, usually bushy. Squirrels, marmots and chipmunks. (Family Sciuridae).

D1 Body with furred lateral membranes. Flying Squirrels. Mearns Flying Squirrel.
.....*Glaucomys sabrinus macrotis* (P. 91)

D2 Body without furred lateral membranes.

E1 Tail less than 1/4 total length; size large. Woodchucks.

F1 Colors pale; length 515 m.m. (20.1 in.). New England Woodchuck.*Marmota monax preblorum* (P.80)

F2 Colors reddish; size slightly smaller. Canada Woodchuck.
....*Marmota monax canadensis* (P.83)

E2 Tail more than 1/4 total length.

F1 Back with conspicuous stripes. Chipmunk.....
...*Tamias striatus lysteri* (P. 84)

F2 Back without conspicuous stripes. Squirrels.

G1 General color gray, slightly washed with brown in summer pelage; size larger. Northern Gray Squirrel.
..*Sciurus carolinensis leucotis* (P.90)

G2 General color reddish brown; parts light; size smaller. Red Squirrel.....
.....*Sciurus hudsonicus*
.....*gymnicus* (P.87)

C3 Tail naked (scaly) or scantily haired.

D1 Size large (length 18 inches); tail compressed laterally.
Muskrat.....Ondatra zibethica zibethica (P. 113)
D2 Tail round and tapering.
E1 Tail more than 2 inches (51 m.m.) long.
F1 Under parts whitish. White-footed mice.
G1 Mid-dorsal region darkest part of back. Tail vertebrae 83-98 m.m. (3.2-3.8 in.). Nova Scotia White-footed Mouse.....
.....Peromyscus maniculatus abietorum (P. 96)
G2 No mid-dorsal darker area. Size about as P. m. abietorum; tail vertebrae 73-125 m.m. (2.8-4.9 in.). Northern White-footed Mouse.....
....Peromyscus leucopus noveboracensis (P. 98)
F2 Under parts gray or darker.
G1 Tail scaly; size large. Common Rat...
.....Rattus norvegicus
(See introd., P. 2)
G2 Tail not scaly; size smaller. House Mouse.....Mus musculus musculus
(See introd., P. 2)
E2 Tail less than 2 inches long.
F1 Fur of back with median chestnut stripe. Red-backed Mice.
G1 Dorsal band less well defined; colors paler and duller; size averaging larger. Length 150 m.m. (5.9 in.); tail 40 m.m. (1.6 in.). White Mountain Red-backed Mouse..Clethrionomys gapperi ochraceus (P. 104)
F2 Fur of back without stripe.
G1 Tail more than 40 m.m. (1.6 in.); incisors ungrooved. Meadow Mice.
H1 Color of head and body uniform; length 178 m.m. (7 in.). Eastern Meadow Mouse.....
.....Microtus pennsylvanicus pennsylvanicus (P. 107)
H2 Nose to eyes of distinctly different color (orange-rufous) from body; length, 175 m.m. (6.8 in.). Rock Vole.....
.....Microtus chrotorrhinus chrotorrhinus (P. 110)

G2 Tail less than 30 m.m. (1.2 in.); upper incisors with longitudinal groove. Lemming mice.
H1 Length more than 128 m.m. (5 in.). Preble Lemming Mouse.....
..Synaptomys borealis sphagicola (P. 103)
H2 Length less than 128 m.m. (5 in.). Cooper Lemming Mouse.....
.....Synaptomys cooperi cooperi (P. 101)

Order RODENTIA

Family Sciuridae

Subfamily Sciurinae

Marmota monax preblorum Howell. New England Woodchuck.

General Description:

"Characters.--Size medium (. . . , larger than canadensis); colors pale (redder than monax, but red not so dark as in canadensis or rufescens); . . .

"Color.--Adult: Underfur on upperparts pinkish cinnamon to light pinkish cinnamon, the bases of hairs fuscous-black; long hairs blackish brown, extensively tipped with white or light buff; top of head and face dark hair-brown to clove brown; sides of face light buff; fore legs burnt sienna or Sandford's brown, the bases of hairs often black; hind legs somewhat paler, shading to pinkish cinnamon; feet black or blackish brown; tail clove brown to black, much mixed with cinnamon; underparts pinkish cinnamon or Sanford's brown, varied with light buff. Young (specimen from Saunderstown, R. I.): General tone, both above and below, pinkish buff (the hairs extensively tipped with that color and the bases of same shade), becoming pinkish cinnamon on hinder back; subterminal band of each hair blackish brown; fore legs Sanford's brown; hind legs tawny; top of head hair-brown."

". . . Intergradation with canadensis also undoubtedly occurs, but material from northern New England is needed to show where the two forms come together. . . ." (A. H. Howell, 1915: 27 and 28).

Measurements.--Howell (loc. cit.) gives the following average measurements for seven adult males from eastern Massachusetts: Total length, 515 [20.12 in.]; tail vertebrae, 120 [4.69 in.]; hind foot, 77.7 [3.03 in.]. Nine adult females from eastern Massachusetts and southern New Hampshire: Total length, 547 [20.58 in.]; tail vertebrae, 141 [5.51 in.]; hind foot, 77 [3.01 in.].

Range in Maine:

This is the form found in southwestern Maine and probably all the way across the lower half of the State. Just how far it penetrates into the Canadian zone before meeting and intergrading with M. m. canadensis is a matter that calls for

further investigation. It will require a great deal of collecting to settle this point, for adult specimens of these rodents vary so much in size, color, and form that large series is needed before one can reach trustworthy conclusions.

For the Portland region Norton (1930:69) states thus:

"Rather common throughout the region in cleared and sprout lands. Its burrows are usually in banks and knolls where the drainage is good, but occasionally from necessity it burrows in land but little elevated above marshes."

Howell (loc. cit.) mentions a specimen from Eliot and one from Norway.

The present writer has seen several woodchucks in the Bangor bog, west of Stillwater, in mainly coniferous growth and on very moist ground. This habitat is strikingly different from the customary one of southern Maine, which is in fields or open deciduous woodlands.

Life History:

Nelson (1918:431) speaks of the monax group as follows:

"It is a familiar habitant of fields and grassy hillsides, especially where bordering woodland offers safe retreat. In such places it digs burrows under stone walls, rocks, ledges, old stumps, or even out in the open grass-grown fields. It commonly lives in the midst of the forest, where its dens are located in a variety of situations. The burrows are marked by little mounds of earth at the entrances and ordinarily contain from twenty to forty feet of branching galleries, one or more of which end in a rounded chamber about a foot in diameter, well lined with dry grass and leaves.

"Within these warm nests the females bring forth from three to nine blind and helpless young about the last of April or early in May. A few weeks later the young appear about the entrance of the burrows sunning themselves and playing with one another, but usually ready to disappear at the first alarm. . . ."

"Its only note is a short shrill whistle, which it utters explosively at frequent intervals when much alarmed. At such timesit also chatters its teeth with a rattling sound as owls sometimes clatter their beaks."

The present writer has had several captive woodchucks, at least one of which was so tame and confiding that it was kept in a cage solely to protect it from stray dogs. On several

occasions it succeeded in getting out of the pen, but the animal was always located sooner or later and made no protest at being returned to confinement.

One captive "chuck" did not hibernate until about the first of December, although for several weeks prior to this it was active only for a brief time during the warmer part of the day. In the wild they seem to hibernate in late September in this latitude.

As observed by the writer, three methods of excavation were used by a woodchuck in constructing a fall den.

First, near the entrance, the dirt was broken loose with the fore feet, pushed back with the hind ones, and then kicked vigorously backward.

Second, down to about two feet below the entrance, the dirt was loosened as before and kicked backward with the hind feet. The "chuck" then backed out of the hole kicking the dirt with the hind feet and so clearing the hole as the animal came to the surface.

Third, below two feet from the entrance, the dirt was still broken loose as before and pushed backward. The "chuck" then turned about, placed its fore feet together against the accumulated pile, and propelled itself to the surface by means of the hind feet only. This seemed a most effective method for "deep shaft" operations. In no other way, I think could it have accomplished so much in the same length of time.

At intervals digging was halted and the "chuck" came to the surface to look about, presumably for enemies. Then it would blow the dirt out of its nostrils and go back to work.

Captive woodchucks, if kept in cages where they cannot get out of direct sunlight, will lap water from a dish on very hot days. Ordinarily they will not drink water, but prefer to have their green food moistened so that they can get their moisture from food while eating.

The writer has tried to force several captive woodchucks to climb trees of varying sizes, but with no success, although a wild one was seen, at Brunswick, about twenty feet up in a slightly slanting willow.

For the best and most complete account of the life history of a woodchuck, see W. J. Hamilton, Jr.'s "The Life History of the Rufescent Woodchuck," Annals of the Carnegie Museum, XXIII, 1934, pp.85-178. ills.

Economic Status:

"They feed on grasses, clover, and other succulent plants, including various cultivated crops, especially vegetables in field and garden, where they sometimes do much damage. The holes and earth mounds they make in fields, in addition to feeding on and trampling down grasses or grain, excite a strong feeling against them, and farmers everywhere look upon them as a nuisance. In New Hampshire so great was the prejudice against them that in 1883 a law was passed placing a bounty of ten cents each on them: 'Provided, That no bounty shall be paid for any woodchuck killed on Sunday.'" (Nelson, loc. cit.).

"The fur of this animal is fully as good as that of the European and some of the Asiatic species, all of which figure extensively in the fur trade. Furthermore, the American animal is larger than most of the Eurasian species, and the color pattern of its skin is such as to make a very handsome natural fur. If a sufficient number of these pelts could be secured in late autumn when they are in prime condition there would seem to be every reason for utilizing them in the fur trade." (Howell, 1915:14).

The present writer has seen a photograph of a coat made of Maine woodchuck skins.

The father of the present writer declares that he ate woodchuck in his "earlier days."

Marmota monax canadensis (Erxleben). Canada Woodchuck.

General Description:

"Characters.--Size small; sexes about same size; colors strongly reddish, above and below; skull small without pronounced sagittal crest.

"Color.--Underfur on upperparts blackish brown at base, succeeded by pinkish cinnamon or light pinkish cinnamon; long hairs blackish brown subterminally, tipped with white or pinkish buff; top of head and face hair-brown, sometimes shading to clove brown; sides of face light buff; feet and legs black, blackish brown, or fuscous, the legs and thighs overlaid with burnt sienna; tail blackish brown, considerably grizzled with cinnamon-buff or light buff; underparts deep tawny or burnt sienna sometimes varied with buff and moderately mixed with black. Melanistic specimens are rarely found, but one from Aitkin, Minn., is glossy blackish brown all over." (A. H. Howell, 1915:31).

Measurements.--Howell (loc. cit.) gives the following average measurements for two adult males from Murray Bay, Quebec: Total length, 513 [20.04 in.] ; tail vertebrae, 108.5 [4.24 in.] ; hind foot, 76 [2.97 in.]. Three adult females from Quebec and Ontario: Total length, 536 [20.94 in.] ; tail vertebrae, 136 [5.31 in.] ; hind foot, 73 [5.31 in.].

Range in Maine:

This subspecies probably is to be found in the northern part of the State, although the writer has seen no account in the literature of typical specimens having been taken.

Howell (loc. cit.) makes the following statement:

"A specimen from Mount Mansfield, Vt., and one from Columbia Falls, Me., (both without skulls), are provisionally referred to Canadensis, the former agreeing in color with the typical form, the latter with the dark Nova Scotia form. . . ."

Life History:

Probably nearly identical with preblorum; canadensis merely dwells in a more boreal habitat.

Economic Status:

See the remarks under preblorum.

Tamias striatus lysteri (Richardson). Northeastern Chipmunk; Ground or Striped Squirrel.

General Description:

"Color.--Summer pelage. . . . : Top of head between sayal brown and cinnamon; facial stripes rather indistinct, dull whitish, washed with light ochraceous buff; dark facial stripes mikado brown; a blackish patch behind the eye; lower cheeks and sides of neck cinnamon buff; median dorsal bands pale smoke gray, narrowly margined with mikado brown; dark dorsal stripes black; light dorsal stripes creamy white, faintly tinged with buff; sides pinkish buff; rump and thighs light ochraceous tawny; shaded in center with mikado brown; hind feet cinnamon or cinnamon buff; front feet pinkish buff; tail above, fuscous black overlaid with pale smoke gray; underparts creamy white. Winter pelage (April): Not appreciably different from summer pelage." (A. H. Howell, 1929:16).

Howell (ibid.) gives the following average measurements of ten adults from Mount Mansfield, Vermont: Total length, 246.4 [9.63 in.]; tail vertebrae, 95.6 [3.73 in.]; hind foot, 35 [1.37 in.]; ear from notch, 14.2 [.55 in.].

Range in Maine:

Found throughout the State, varying from uncommon to abundant locally.

Howell (ibid., 19) mentions specimens from the following Maine localities: Dickey; Eliot; Greenville; Kennebago Lake; Penobscot River (each branch); Sebec Lake; South Twin Lake, Penobscot County; Umbagog Lake.

Life History:

"The eastern chipmunks (Tamias) are largely ground dwellers, and although they can climb trees they rarely do so. Indeed, in many localities, they are commonly called "ground squirrels." Their favorite habitats are wooded hillsides or mountain slopes, especially about bluffs or ravines where rocks abound; they are partial also to stone walls and rail fences but rarely leave their projecting shelter for any distance to enter adjacent fields. Though usually preferring dry upland timber, they are occasionally found in moist bottom-land woods. Probably food and shelter are the most important factors in their choice of a habitat. Community life is not strongly developed in the chipmunks as it is in the prairie dogs or the true ground squirrels, but the animals often associate in family groups, and in winter several individuals may be found occupying the same den and subsisting on a common store of provisions." (A. H. Howell, 1929:2-3).

"The eastern chipmunks spend a large part of their lives in burrows, which they dig for themselves, often beneath a rock, a stone wall, the roots of a tree, or a building. The entrance holes are small and inconspicuous, and there is rarely any earth thrown out about the used doorways. This is accomplished, apparently, by digging the burrow in some thicket or sheltered place and, after it is completed, closing up the original opening and making another entrance at the other end where it reaches the surface. . . ." (Ibid., 4).

"All through the summer and especially early in the fall the eastern chipmunks are busy gathering food materials, which they carry to their dens in their capacious cheek pouches." (Ibid.).

"The extensive storing of food by the eastern chipmunks in their dens and the fact that they do not become noticeably fat

in autumn point to the conclusion that they remain more or less active during the winter, and the rather scanty recorded observations mainly bear out this conclusion. . . ." (Ibid.,5-6).

"The mating period of the eastern chipmunk is not definitely known but doubtless extends over a considerable period, beginning early in spring. A female specimen taken by Vernon Bailey in Marquette County, Mich., on March 30, 1907 (the first individual seen that season), contained small embryos; in Westchester County, N. Y., Rowley opened a burrow on May 10 and found five young chipmunks more than half grown. . . . Half-grown young, accompanying their parents, may also be seen throughout the summer and until the middle of October."

"The young in both genera Tamias and Eutamias vary from four to six in number and the females have four pairs of mammae, arranged as follows: Pectoral $\frac{1}{1}$; abdominal, $\frac{2}{2}$; inguinal, $\frac{1}{1}$." (Ibid., 8).

"The common note of the eastern chipmunk is a rather low-pitched cluck or chuck, which at times is repeated rapidly and gives the suggestion of a song. Seton (1909, p.46) describes an instance of a chipmunk repeating these notes without ceasing for a period of 11 minutes at the rate of 130 chirps per minute. Another note is a higher-pitched chip, which much resembles the alarm note of a hooded warbler (Wilsonia citrina). When frightened and about to dive into its burrow the chipmunk utters a rapidly trilled whistle accompanied by a nervous twitching of the tail." (Ibid., 8-9).

"The food of the eastern chipmunk comprises a considerable variety of nuts, fruits, grains, and other vegetable matter, with a small percentage of animal matter. The various nuts are probably most frequently eaten, these including acorns, hazelnuts, beechnuts, hickory nuts, chestnuts, and chinquapins. Corn is consumed in some quantities and wheat and oats less frequently. Wild fruits and berries furnish a considerable part of the chipmunk's diet; those commonly eaten include strawberries, raspberries, blueberries, gooseberries, wild cherries, and the fruit of the Virginia creeper (Parthenocissus), arrowwood (Viburnum), dogwood (Cornus), basswood (Tilia), sweet gum (Liquidambar), prickly-ash (Xanthosylum), and red maple (Acer rubrum). Seeds of various weeds and grasses are frequently eaten, and wintergreen berries. . . furnish a favorite food early in spring in Massachusetts. Mushrooms are mentioned by Mearns as one of the chipmunk's food items.

"Animal matter apparently forms a very small percentage of the total food. Land snails and insect larvae and pupae are eaten not infrequently, and solitary instances are reported of a chipmunk eating a salamander, a frog, and a snake. Attacks upon birds or their eggs apparently are rare, but a few cases are recorded of this objectionable habit. . . ." (Ibid., 9).

(See also Preble, 1936, for data on chipmunks in New Hampshire).

Economic Status:

"The eastern chipmunks occasionally damage grain in the fields and dig up and eat corn and other planted seeds, but in the main their habits in relation to agriculture are neutral. The western chipmunks, living as they do largely in mountains and the wilderness, remote from agricultural sections, also are mainly neutral in their relation to man's interests. Occasionally, however, where their habitat borders on cultivated fields, they do some damage locally to crops. In some localities they are reported to be destructive to grain, especially oats, in the shock. Standing wheat is sometimes injured, the stems being bent down and the heads cut to be eaten or carried by the chipmunks to their storehouses. They sometimes prove troublesome on areas that have been planted for reforestation by eating the tree seeds. If chipmunks are abundant in regions where forest planting is being carried on they frequently eat or carry off a good share of the planted seeds and it has been found necessary, in order to insure a successful stand, first to reduce the numbers of chipmunks by trapping or poisoning. Under natural conditions they apparently have no harmful effect on forest growth." (Ibid., 10-11).

Sciurus hudsonicus gymnicus Bangs. Red Squirrel; Chickaree.

General Description:

"A small, arboreal Squirrel with flat, bushy tail; fairly long ears; no internal cheek-pockets; incisors narrow; rudimentary first upper premolar generally present, but sometimes absent; inner toe on forefoot very small; pelage fairly long and soft, but not silky; manner alert; diurnal in habit.

"Color.--Sexes colored alike; a marked seasonal variation." (Anthony, 1928:233).

"Size small; color dark. Upperparts, in winter, rich rusty red; sides olive-gray; underparts gray, sprinkled with black. Summer pelage duller red above; black lateral line present; underparts clear white. Total length, 12 inches [307 m.m.]; tail vertebrae, 4.8 inches [122.8 m.m.]; hind foot, 1.8 inches [46 m.m.] . . . ." (Ibid., 245).

The type locality for this subspecies is Greenville, near Moosehead Lake, Piscataquis County, Maine and the description

of the type appeared in Proc. New Eng. Zool. Club, Vol. 1, p. 28. March 31, 1899.

Range in Maine:

Red squirrels are found throughout the State.

Norton, in writing of the Portland region (1930:70), stated as follows:

"Common throughout the region including the large and medium size spruce clad islands of Casco Bay. . . ."

Although there is, undoubtedly, a considerable variation in red squirrels from different parts of the State, it seems quite likely that all specimens from within our boundaries are referable to the subspecies gymnicus. The writer bases this statement on the fact that coastwise specimens are gymnicus, while Greenville, which is far inland, is the type locality.

The subgenus Tamiasciurus has received no adequate treatment since it was revised by J. A. Allen (1898).

Various papers, published in past years, have listed more than one subspecies of red squirrel from Maine.

Life History:

"This squirrel shows a strong preference for coniferous forests, whether of hemlock, spruce, fir or pine, but may be common in woods where conifers are few and widely scattered. Although usually diurnal and busily occupied from sunrise until sunset, it sometimes continues its activities during moonlight nights, especially when nuts are ripe and it is time to gather winter stores. During warm, pleasant days in spring and fall, when the nights are cool, it often lies at full length along the tops of large branches during the middle of the day, basking in the grateful warmth of the sun.

"The nests, which are located in a variety of situations, are made of twigs, leaves, or moss, and lined with fibrous bark and other soft material. Some are in knot-holes or other hollows in trees, others may be built outside on limbs near the trunk, and still others are in burrows made in the ground under roots, stumps, logs, brush heaps, or other cover offering secure refuge. Apparently several litters of young, containing from four to six, are born each season, as they have been found from April to September.

"They do not hibernate, but are active throughout the year, except during some of the coldest and most inclement weather. To provide against the season of scarcity, they accumulate at the base of a tree, under the shelter of a log, or other cover, great stores of pine, spruce, or other cones, sometimes in heaps containing from six to ten bushels. They also hide scattered cones here and there and place stores of beechnuts, corn, and other seeds in hollows or underground store-rooms. They are fond of edible mushrooms and sometimes lay up half of them among the branches of trees or bushes to dry for winter use. . . ." (Nelson, 1918:454).

Interesting data, mainly pertaining to food habits in New Hampshire, has been recorded by Cram (1924). A more complete and very valuable account of this animal has been written by Klugh (1927).

In his account of the red squirrel, Seton (1929, IV:125) mentions an incident first recorded in Forest and Stream (Sept. 30, 1911, p.521) of gulls bringing the squirrels to grief at Moosehead Lake. It seems that the squirrels, while swimming in the lake and thus placed at a disadvantage, are killed by the herring gulls and carried to the gull colonies. Mr. C. M. Aldous, while at Moosehead in 1936, found similar evidence.

Economic Status:

Seton (1929, IV:148-149) considers the red squirrel as valuable as a forest planter, as food for fur-bearers, and especially for the "picturesqueness" which it adds to our woodlands.

Regarding the egg eating habit of the red squirrel, Nelson (1918:454-455) writes as follows:

"The worst trait of the red squirrel and one which largely overbalances all his many attractive qualities is his thoroughly proved habit of eating the eggs and young of small birds. During the breeding season he spends a large part of his time in predatory nest hunting, and the number of useful and beautiful birds he thus destroys must be almost incalculable. The number of red squirrels is very great over a continental area, and one close observer believes each squirrel destroys 200 birds a season. Practically all species of northern warblers, vireos, thrushes, chicadees, nuthatches, and others are numbered among their victims. The notable scarcity of birds in northern forests may be largely due to these handsome but vicious marauders."

Sciurus carolinensis leucotis (Gapper). Northern Gray Squirrel.

General Description:

"Larger and grayer than typical carolinensis; apt to occur in black or melanistic phase; soles of feet may be hairy in winter. Upperparts, in winter, silvery gray with faint grizzling of yellowish brown and black; a faint wash of yellowish brown on head, back, and upper surfaces of hands and feet; underparts white. Summer pelage with more rusty brown, especially along sides. Melanistic phase, everywhere black; various degrees of integradation between gray and black phases may occur. Total length, 20 inches [512 m.m.]; tail vertebrae, 9.2 inches [236 m.m.]; hind foot, 2.8 inches [72 m.m.]. . . ." (Anthony, 1928:253).

Range in Maine.

The gray squirrel is found throughout the State. Apparently the occupation and cultivation of land has made conditions more favorable for this animal.

In 1868 Henry Clapp, of Brownville, wrote thus:

"Have seen a few Gray Squirrels this year; never saw but one before." (Clapp, 1868:659).

Life History:

"The Gray Squirrel builds a bulky nest of leaves and twigs in the crotch of a limb or else chooses a hollow in some rotted trunk. The young number from four to six and often two litters are raised in a year. The first brood appears in March or April.

"This Squirrel has several call-notes, a loud, husky bark and a whining whicker being the commonest. It is an excellent climber, racing through the trees and making long leaps when chasing one another or threatened by danger. It has an active, nervous temprement, although not to the same extent as the Red Squirrel." (Anthony, 1928:254).

Economic Status:

In Maine this animal is hunted for food and "sport." For its esthetic value it is kept in parks. It probably also has some value as a forest planter.

Subfamily Pteromyinae

Glaucomys sabrinus macrotis (Mearns). Mearns Flying Squirrel.

General Description:

"An arboreal squirrel of small to medium size, almost entirely nocturnal in habit, with large eyes, very soft pelage, and broad, lateral folds of skin extending from wrists to ankles which enclose a slender, cartilaginous process or stiffening rod arising from the wrist; tail flat and broad, tip rounded." (Anthony, 1928:260).

"Color.--Winter pelage (adult): Upperparts cinnamon or pinkish cinnamon (rarely light pinkish cinnamon), shading on sides to pinkish buff; sides of face pale smoke gray, this color extending back on sides of neck beyond the ears; top of nose frequently tinged with gray; upper surface of membranes clove brown, fore feet drab, clouded with dull white; hind feet, above, light hair-brown or mouse gray; beneath, soiled whitish, shaded with drab or buff; tail, above, dull cinnamon, more or less mixed with hair brown or fuscous, the general tone varying from hair brown to pale snuff brown; beneath, pinkish cinnamon or light pinkish cinnamon; under parts white, irregularly shaded with light pinkish cinnamon. Summer pelage: Similar to winter pelage, but upperparts usually slightly darker - pale orange-cinnamon. Young (October): Upperparts between wood brown and fawn color, otherwise as in adult."

"Measurements.--Average of 16 adults from New York and New England: Total length, 275.6 (263-290) [10.76 (10.27-11.33 in.)]; tail vertebrae, 126.4 (115-135) [4.94 (4.49-5.27 in.)]; hind foot, 36 (34-38) [1.41 (1.33-1.48 in.)]; ear from notch (dry), 18.8 (16-20) [.73 (.62-.78 in.)]. . . ." (A. H. Howell, 1918:35-36).

Range in Maine:

Generally distributed throughout the State.

Howell (ibid., 37) lists specimens from the following Maine localities: Bucksport; Greenville; Lincoln; Moosehead Lake; Stuben; Third Mopang Lake, Washington County.

Life History:

Regarding their breeding habits in the Portland region, Norton (1930:72) writes as follows:

"It would seem that in this locality this species produces several litters of young in a season. I have just noted a brood of nude young found May 15. In the collection of the Portland Society of Natural History are specimens of the young partly moulted taken August 24, 1908, and September 19, 1906, while a young specimen in unmoulted juvenal pelage was taken October 13, 1912."

Anthony (1928:368) writes thus:

"These animals make their nest in natural cavities in tree trunks and in old Woodpecker holes. The Squirrels are active throughout the winter and do not hibernate; cold apparently has no terror for the Flying Squirrel, for one subspecies ranges across the Arctic Circle."

The present writer recalls having seen an outside nest of a flying squirrel in a hemlock grove on the bank of the Cathance River in Topsham, Maine. The nest was quite near the top of a forty-or fifty-foot hemlock and appeared, externally, much like the nest of a red squirrel. It was lined with very soft material and contained three hairless young when first visited. The adult climbed to the top of the tree and remained there while the nest was being inspected.

There are numerous records of outside nests made by flying squirrels; a good description of an outside nest of G. s. macrotis is that of Snyder (1921).

Regarding the diet of the more southerly Glaucomys volans, Nelson (1918:466) writes thus:

"This food is extremely varied and includes whatever nuts grow in their haunts, as beechnuts, pecans, acorns, and others, with many kinds of seeds, including corn gathered in the field, and buds, and fruits of many kinds. They also eat many insects, larvae, birds and their eggs, and meat. Taking advantage of their known liking for bird flesh, they may frequently be caught by concealing a trap on top of a log in the woods and scattering bird feathers over and about it. Trappers for marten and other forest fur-bearers are much annoyed in winter by the persistence with which the flying squirrels search out their traps and become caught in them, thus forestalling a more valued capture. . . ."

Economic Status:

A. H. Howell (1918:10) writes thus of flying squirrels in general:

"The food habits of the flying squirrels are such that they are almost entirely harmless. So far as known they do not

damage farm crops, and the relatively small number of nuts which they consume does not seriously affect the total supply. They have been suspected of destroying the eggs and young of wild birds, but no definite evidence on this point is forthcoming. Occasionally they may take possession of bird boxes or enter the lofts of dwelling houses and thus become objectionable, but ordinarily their gentle and confiding ways and their interesting habits make them desirable neighbors."

Family Castoridae

Castor canadensis canadensis Kuhl. Beaver.

General Description:

"Beavers are compact, heavy-bodied, strongly framed animals. . . with powerfully developed bones and muscular systems, broadly flattened naked tails, and dense coats of fine, soft, waterproof underfur, hidden by coarse outer or guard hairs, generally of some shade of dull or rusty brown. The hind feet are large and the five long toes fully webbed for swimming, the two inner toes on each foot being provided with unique and remarkable combing claws; the front feet are small and unwebbed, and are used mainly as hands. The eyes are small, with very limited range of vision; the ears are short, fur lined, valvular (closing under water), and very keen of hearing; the nostrils are small and valvular, with large and complex nasal cavities lying back of the openings, and have an unusually keen sense of smell. The mouth also is valvular, with hairy lips closing perpendicularly back of the long protruding, chissellike incisors, so that the water does not enter the mouth when the incisors are used in cutting or tearing up roots or sticks under water. The genital organs also are well protected from the water, being concealed under the skin and opening into the general anal cloaca, so that the sexes are not easily determined by external examination, except in adult females, which have four conspicuous teats, two on each mammary gland. A pair each of large musk and oil glands lie under the skin of the belly just in front of the anal opening. The stomach and intestines are very large to accommodate the large quantity of coarse food consumed.

"A fair-sized, probably 3-year-old, female beaver, caught near Ashland, Wis., measured in total length 42.5 inches (1,080 millimeters), the hind foot 7 inches (180 millimeters), and the length of the ear 1¼ inches (34 millimeters). The weight was 50 pounds. The young about two weeks old weighed 1¾ and 2 pounds, respectively; yearling beavers weigh apparently 25 to 30

pounds; two-year-olds about 40 or 45 pounds; and three-year-olds probably 50 pounds. Old and large beavers reach a weight of 60 to 70 pounds, and there are records of old and very fat beavers weighing from 100 to 110 pounds." (Bailey, 1922:4).

Range in Maine:

Found in suitable localities in the northern two-thirds of the State. Locally rare or absent in the coastal third of Maine.

That the beaver was probably exterminated or driven away from the thickly populated coastal area is shown by Norton's statement (1930:73) for the Portland region, which follows:

"Though formerly common throughout the region, the beaver has long been extirpated here. Southgate indicates that the animal was common in the Nonesuch and other streams in Scarborough until about 1720."

The present writer knows of at least two occupied beaver houses on Pushaw Stream, within ten miles of the University of Maine. Still another large house is on Dead Stream, a tributary of Pushaw Stream, a few miles farther upstream.

Life History:

"Beavers apparently begin breeding when 1 year old, as one or two embryos are often found in females of 25 or 30 pounds, but some may not breed the first year. At 2 years old, when weighing 40 or 45 pounds, they may have 4 young and this seems to be the normal number for most beavers. There are a few records of 6 young and two or three of 8 embryos found in large, old females; but as the females have only two teats on each of the two large mammary glands, more than 4 young must be abnormal. So far as we can tell, the sexes are about evenly divided in numbers.

"The young are born in May and a few late litters apparently in June. There seems to be no evidence of more than one litter in a season, and there is no more than time for one litter to grow up and get ready for winter between May and November. The time of mating and the period of gestation are not definitely known.

"The mother beaver takes good care of the young and brings them tender plants and rootlets before they are old enough to leave the house. The father apparently remains away while the young are small, but in a large house in August I found 2 females, 1 male, and 6 good-sized young. Like all rodents, beavers are polygamous, and the fact that fights among the males take

place indicates that the older ones strive for supremacy." (Bailey, 1922:9).

The following paragraphs, pertaining to beaver in Maine, are quoted from the picturesque account of Clapp (1868:661-662):

"The Beaver makes his pond to enable him to bring and store his food, which is the bark of white birch, yellow birch, mountain ash, swamp maple, poplar, and willow, and perhaps others. They throw their brush over their passage way, so that the top of it is in the water; that is, the butt of the bush is over the passage way, and the twigs of the top in the water. They cut down the trees, which are for food, and stick the butts under the brush, leaving the tops to float. If the tree is larger than one and a half inches, or two inches at farthest, the beaver cuts off the top, and drags it and the stems to his house separately. . . . I have seen one stay under water seven and one-half minutes by the watch, and have heard from a reliable man of their staying twelve to fourteen minutes. The Otter will kill young Beavers. I don't know of anything else that destroys them except man. Their meat is excellent, and the meat from their tail is a delicacy.

"The Dam.--I will describe one dam. It was lately built. It was six rods long; not straight across the stream, but the middle was further down stream than each end. The groundwork was of small alders, cherry trees, and bushes. Nearer the top, trees from one to one and a half inches in diameter were placed on, the butt being hauled over so as to rest on the bottom of the stream below, and the top woven into the dam. On the upstream side it was covered with moss, mud, gravel, and rocks, some of the rocks I judge would weigh fifteen to twenty pounds. The water dripped over the dam evenly the whole length. The dam flowed the pond above, which was a mile long. It was not at the narrow place in the brook. It had been built the summer before, and in the fall while I was there, I caught six Beavers there, and I think I caught them all. There were seven houses in the neighborhood, but only one of them was new. I drove them from this to one of the old ones, and then to another. This last was a mile from their dam. They began to haul wood to it. I caught none at the new house, but two at the first old house they fled to, and four at the second. I frightened them from the new house by paddling around it in my canoe. It was on an island. They work on their house, putting mud and sticks on it, till freezing weather."

Economic Status:

"In the beginning of local history the trade in furs, in which the beaver supplied a leading part, was so important an

inducement for early navigators to these shores that rights to grade with the natives were conferred in charters and grants. According to Willis . . . the number of vessels visiting the 'New England' shores for furs and fish increased from ten or twelve in 1621 to fifty in 1624. So lucrative was the business, that high handed methods to share in the trade were resorted to by some without rights. In 1624 Levett found in Portland Harbor 'an evil member, . . . having a great ship with seventeen pieces of ordinance and fifty men' carrying on by force an illicit trade for furs. Keen competition prevailed between the English and French, especially to the eastward at the disputed boundaries of the two nations." (Norton, 1930:74).

"As in all cases of extermination, the decrease in numbers of the beaver was peripheral, or a closing in from the borders of its range. After the beaver was extirpated from throughout this [the Portland region] and larger and larger areas beyond, no legal protection was given to it by the State until 1866." (Norton, ibid.).

Under the protection of the law beavers have multiplied and are now commonly found in suitable localities over a large part of Maine. The annual beaver catch is stringently controlled; the average annual catch, computed over the eight-year period of 1928 to 1935, inclusive, being 682 pelts.

"Importance of beavers.--Beavers are of primary importance as fur bearers and conservators of water and soil; because of their unique habits they are also animals of general interest. In certain types of forest country, on farms, in irrigation ditches, and along trails, roads, and railroads, they are capable of doing serious damage; in such situations it becomes necessary eight to remove them or to control them intelligently. Their control, however, is not difficult, and where they are doing damage on private lands they can be quickly removed either by trapping alive for shipment or in the ordinary way for their fur." (Bailey, 1922:27-28).

Family Cricetidae

Subfamily Cricetinae

Peromyscus maniculatus abietorum (Bangs). Nova Scotia White-footed Mouse; Deer Mouse.

General Description:

"Color.--No.2201 Bangs Collection, in slightly worn summer pelage; Similar to P. m. gracilis, but paler and grayer; upperparts and sides almost uniform drab, with very fine dusky

grizzling and scarcely any indication of a dark dorsal stripe; orbital region and base of whiskers with weak dusky markings; tail brownish black above, white below; underparts white. Full winter pelage (No. 1473 U. S. National Museum): Almost as in same pelage of P. m. gracilis being not grayer, but slightly browner; general color bister, with a tinge of fawn color, this produced by grizzling of pale fawn color and dusky; back essentially like sides; underparts pure snowy white."

"Measurements.--Type: Total length, 200 [7.81 inches]; tail vertebrae, 103 [4.02 inches]; hind foot, 20 [.78 inches]. Average of 10 adults from Third Mopang Lake, Maine: 177 (171-187) [6.91 (6.68-7.38 in.)]; 91.6 (82-97) [3.57 (3.20-3.78 in.)]; 21 (20-22) [.82 (.78-.86 in.)]." (Osgood, 1909:45).

Range in Maine:

The whole range of this mouse is said to be:

"Nova Scotia and neighboring parts of eastern Canada; west to central Maine." (Osgood, loc. cit.)

At Katahdin:

"Nine specimens were taken that correspond perfectly with specimens of typical P. canadensis [P. maniculatus] in the Biological Survey Collection. They were secured from the lowest to the highest trapping grounds, one individual being taken under a rock on the tableland, but they are not abundant animals." (Dutcher, 1903:67).

For the Portland region:

"I have not taken this species about Portland; Pope took it at Brunswick where he found it very local." (Norton, 1930: 75).

This confirms Pope's statement that Brunswick is the southern end of the range of this deer mouse.

Osgood (loc. cit., p.46) lists the following Maine stations for this species:

Big Deer Isle; Blue Hill; Bucksport; Columbia Falls; Greenville; King and Bartlett Lake; Mount Katahdin; Third Mopang Lake; Sebec Lake; South Twin Lake, Penobscot County; Upton.

Like the meadow mouse, this deer mouse probably also tends to vary coastwise, on the northeast, from inland specimens.

Copeland and Church have given the subspecific name argentatus to this mouse on Grand Manan Island, New Brunswick.

Life History:

The life history of this mouse is about the same as that of P. leucopus. They are said to prefer more open ground, however.

For an ecological study, partly of this species, at Mount Desert Island, see B. W. Johnson, 1927:276-284.

Economic Status:

Probably differs but little from P. leucopus.

The western forms of P. maniculatus eat a good deal of grain, but opportunities for destroying such crops are very limited in the northeast.

Peromyscus leucopus noveboracensis (Fischer). Northern White-footed Mouse; Deer Mouse.

General Description:

"Color.--Similar to that of P. leucopus, but lighter and brighter; underparts usually pure white, entirely concealing undercolor; tail less distinctly bicolor. No. 69902, female adult, November 25, Ossipee, N. H., new winter pelage: Upperparts cinnamon rufous, lightly mixed with dusky lines on sides, more heavily on middle of back; underparts creamy white; hands, feet, and forearms white; 'ankles' slightly brownish; ears dusky brownish with pale whitish edges; tail white below, dusky above. No. 126310, male adult, April, Newburgh, N. Y., pelage slightly worn: Similar to No. 69902, but sides brighter, less mixed with dusky; dark dorsal area more contrasted with sides. No. 98776, male adult, June 10, Eliot, Me., pelage worn: General color of upperparts bright tawny, shading to dark cinnamon rufous in middle of back; sides nearly pure tawny with very few dusky tipped hairs and few brownish tipped ones. No. 76386, adolescent female, Ossipee, N. H., Dec. 30: Sides, face, etc., fawn color lightly mixed with dusky; middle of back decidedly darker."

Measurements.--"Of ten adults from Ossipee, N. H.: 166.4 (159-182) [6.50 (6.21-7.10)in.]; 79 (75-88) [3.08 (2.93-3.43 in.]; 21 (20-22) [.82 (.78-.86) in.].

"The name 'deer mouse' seems to have been given it because of its supposed seasonal change of color, corresponding to that

of the Virginia deer. Adult mice, however, do not show such marked seasonal difference in color as the deer. The gray and the 'red' coats of the deer are those of winter and summer, but those of the mice are of the adolescent and the fully mature, regardless of season. The pelage of the adult is almost continually changing, although it appears to be entirely renewed only once a year." (Osgood, 1909:117-118).

Range in Maine:

Not recorded for Katahdin by Dutcher.

"Southern Counties." (Allen, 1904:14).

Pope found it in abundance at Brunswick.

For the Portland region:

"Common in all open woodlands, and active throughout the year." (Norton, 1930:75).

Osgood (loc. cit. p.120) lists the following stations: Eliot, Oakland, Small Point.

While the available literature does not mention this species for Canadian zonal areas or any of the higher peaks within the state, it is interesting to note that Miller found it about the buildings on Mount Washington, New Hampshire.

Life History:

"White-footed mice feed mainly on many kinds of seeds and nuts and vary this diet with snails, insects, and sometimes with the flesh of dead birds or other mice. As they do not hibernate they lay up abundant stores of grain and seeds of many kinds in addition to a variety of nuts, as acorns, beech nuts, pine nuts, maple seeds, and others, according to the locality. The stores are hidden in hollows in logs, stumps, trees, or in the ground. When in captivity they have shown themselves expert in catching flies, sometimes capturing them with their teeth and again with their front paws used with all the dexterity of little hands.

"Several litters of young containing from three to seven each are born, the first usually appearing in spring and the last in fall. The young are blind and helpless at birth, and in this condition cling so tenaciously to the mother's teats that when she is frightened from the nest they are often carried off attached to her." (Nelson, 1918: 422).

In his article on mammals of Brunswick, Maine, Pope (1922: 24) says of this mouse:

"The white-footed mouse apparently has several litters of young in a season, as a female taken alive May 28 gave birth to seven young June 10, while an immature specimen about two thirds grown was taken June 8, in the same locality. In the fall, after Sept. 30, all specimens taken were in adult pelage."

Regarding their nests, Stone and Cram (1904:132) state the following:

"In summer they appropriate the nests of song birds, in bushes and low trees, fitting them up for use, just as squirrels do those of hawks and crows. It appears probable, moreover, that they are not over scrupulous in the matter of waiting for the rightful owners to depart before taking possession, as they are great lovers of fresh meat and have often been caught in the act of devouring both eggs and young birds.

"They are said sometimes to fashion nests of their own among the branches, beginning with a platform of loose twigs laid crosswise for a foundation. Their lives, in fact, are pretty closely copied after those of the squirrels. Their diet is almost identical; nuts, berries, and grain being what they chiefly depend upon."

Seton (1920:276-284) has interesting information on the life history of this mouse at Cos Cob, Conn.

Nelson (loc. cit.) says of their voice:

"Some individuals at least of the white-footed mice, like others of the genus Peromyscus, are known to have a prolonged and musical song. It is a fine warbling ditty, a little like the warbling of a canary. A number of good observers have recorded these performances, but they appear to be so infrequent that most people with woodland experience have never heard them."

Economic Status:

". . . The common form of the northeastern United States (P. l. noveboracensis) is especially fond of basswood seeds, pits of wild cherries, beechnuts, and acorns, and often stores them in burrows or in cavities in old stumps. It eats also seeds of many wild shrubs, weeds, and grasses. In wooded regions or on waste land, where it commonly lives, it is not very injurious to agriculture, but when living about the edges of cultivated ground it sometimes devours or carries away grain in considerable quantities. . . ." (Osgood, 1909:37).

"The lives of these mice are passed in constant fear of a host of enemies. Hawks and owls, bluejays, and shrikes in the bird world are ever on the alert to capture them, while skunks, weasels, minks, foxes, and snakes persistently seek them in their retreats." (Nelson, loc. cit.).

Subfamily Microtinae (Voles and Lemmings)

Synaptomys cooperi cooperi Baird. Cooper Lemming Mouse.

General Description:

"General characters.--A small race of Synaptomys with with light rostrum, small incisors, weak brain case, and little or no interorbital ridging.

"Color.--As in the subgenus, dorsally somewhat close to the cinnamon brown of Ridgway. Below, the skins with least worn pelage show a distinct tinge of cream, while the others are of the usual plumbeous."

"Measurements.--Average of collector's measurements of five largest individuals from Quebec: Total length, 118 [4.61 in.]; tail, 16.5 [.64 in.]; foot, 18 [.70 in.]. Average of four adult skulls from Quebec: Condylobasilar length, 23.1 [.90 in.]; rostral length, 6.1 [.24 in.]; rostral breadth, 5 [.19 in.]; interorbital breadth, 3 [.12 in.]; zygomatic breadth, 15.1 [.59 in.]; lamboidal width, 11.9 [.46 in.]; incisive foramina, 4.3 [.17 in.]; height, 8.6 [.34 in.]." (A. B. Howell, 1927:12-13.

Range in Maine:

The following stations are mentioned in the available literature:

Mount Katahdin, altitude, 500 feet (Dutcher, 1903:68); Mount Madawaska, east branch of Penobscot River, Sebec Lake (A. B. Howell, 1927:14); Brassua Lake, Grafton (Copeland and Pope, 1917:159); Eagle Lake in Aroostook County (G. M. Allen, 1904:17); ? Mount Coburn for Synaptomys, but species not designated (Wyman, 1923:190).

G.M. Allen's Eagle Lake record is based on the capture of two specimens, first reported by C. F. Batchelder, Proc. Boston Soc. Nat. Hist., XXVII, 1896, p.186.

Life History:

Dutcher (1903:68) speaks as follows in regard to this species at Katahdin:

"Of the subgenus Synaptomys, one specimen was taken August 3, in a small grassy clearing in the woods at an altitude of about 500 feet, . . ."

Coveland and Pope (1917:159) add a bit more to our knowledge of Synaptomys cooperi:

"Brassua Lake. Two specimens were trapped by E. C.Pope, October 27 and 29, 1913, in a clearing overgrown by raspberry bushes in runs frequented by Evotomys [Clethrionomys] and Microtus.

"Grafton. On September 10, 1915, a female, containing three embryos measuring about 6 m.m. in length, was taken in a sphagnum bog under the roots of a small spruce tree."

"Stegeman (1930:460-466) has given a good account of this animal in Michigan. The following paragraphs are extracted from his paper:

"Synaptomys cooperi, as has been reported, seems to be colonial and in the territory here studied it was found concentrated in three small areas. In the first of these areas, about 100 feet square, 10 specimens were taken; in the second one, 50 feet wide by 200 feet long, 14 specimens; and in the third, which covered about one acre, 18 specimens."

"The runways are like those of Microtus, and at irregular intervals they have side chambers which seem to be used as feeding and resting places. Cut grass stems were found in these stations, and green colored feces, though scattered throughout the runways, were here accumulated."

"The nests are made entirely of dry grass and resemble the nests of Microtus pennsylvanicus."

"From my observations it appears that Synaptomys cooperi cooperi is chiefly herbivorous, feeding on grass stems and seeds. Sections of grass stems are found in the runways and the resting places."

"A female nursing young was found to be pregnant, which indicates that at least two litters may be born in rapid succession."

Economic Status:

The genus Synaptomys, because its habitat is usually land unsuitable for cultivation, and because of its apparently limited distribution, is of no economic significance except possibly as food for raptorial animals.

Synaptomys borealis sphagnicola Preble. Preble Lemming Mouse.

General Description:

"General characters.--A race of Synaptomys, subgenus Mictomys with large, well-ridged skull, long rostrum, and narrow interparietal.

"Color.--Dorsal coloration close to the Prout brown of Ridgway, which is most intense upon the rump; anteriorly duller, grayer, and more grizzled. Tail, distinctly bicolor."

"Measurements.--Collector's measurements of the type in the flesh: Total length, 132 [5.15 in.]; tail, 24 [.91 in.]; foot, 20 [.78 in.]. Of the skull of the type: Condylobasilar length, 25.8 [1.01 in.]; rostral length, 6.8 [.26 in.]; rostral breadth, 4.9 [.19 in.]; interorbital breadth, 2.8 [.11 in.]; zygomatic breadth, 16 [.62 in.]; lamboidal width, 12.4 [.48 in.]; incisive foramina, 5.7 [.22 in.]; height, 9.3 [.36 in.]." (A. B. Howell, 1927:30).

"Externally, specimens of sphagnicola may be told from borealis by the former being grayer (less brown) anteriorly, and by the longer foot. The most valuable cranial differences are the longer skull, in the case of the eastern race, and the proportionally longer rostrum." (Ibid., 31).

Range in Maine:

As is the case with cooperi, very incompletely known. I find in the literature but one record of its capture in Maine ---at Katahdin:

"Of the subgenus Mictomys two examples were taken, August 28, and August 30, respectively, under some balsam scrub by a spring on the table land, at an altitude of 4500 feet.

"A thorough and painstaking search was made of the entire top of the mountain, and a line of nearly ninety traps was carefully set, baited, and tended, but the only microtines secured were these two lemmings. Strange to say the entire top of the mountain was covered with old sign, without doubt of this species." (Dutcher, 1904:68).

Life History:

Undoubtedly there is little difference in life history between the present form and S. cooperi. I find nothing applying specifically to this form in the available literature.

Economic Status:

Of no significance in Maine.

While we are on the subject of rarities, it might be well to bear in mind the following statement,[1] which refers to the genus Phenacomys, not known at present to occur in New England:

"More material is urgently needed from the whole of the eastern half of Canada, especially Ungava, Quebec, and the area to the south of Hudson Bay, from the Hudsonian Zone of New Brunswick, and from the New England States"[2]

The form that might possibly occur in northern Maine is Phenacomys ungava ungava.

Clethrionomys gapperi ochraceus[3] Miller. White Mountain Red-backed Mouse.

General Description:

"Similar to E. gapperi, but slightly larger and much duller and paler; fur long and lax; skull as in gapperi.

"Measurements.--Type, measured in flesh by Gerrit S. Miller, Jr.: total length, 148 m.m. (5.8 in.); tail vertebrae, 39.6 m.m. (1.54 in.); hind foot, 19 m.m. (.74 in.). Skull of type: basal length, 22 m.m. (.86 in.); nasals, 6.7 m.m. (.026 in.); zygomatic breadth, 13 m.m. (.50 in.); mastoid breadth, 11.3 m.m. (.44 in.): upper molar series, 5 m.m. (.19 in.).

"General remarks.--This species differs from typical gapperi in paler, duller coloration - the opposite extreme from the dark, rich carolinensis which inhabits the tops of the mountains of North Carolina. Specimens from Ossipee, N. H., are evidently intermediate between gapperi and ochraceus. In size they even exceed ochraceus, and in color they are slightly paler than true gapperi. Specimens from Digby and James River,

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1. From "Voles of the Genus Phenacomys" by A. Brazier Howell. North Am. Fauna, No. 48, 1926. Washington, Govt. Printing Off. Page 3.
2. Italics mine.
3. Formerly Evotomys gapperi ochraceus.

Nova Scotia, kindly placed at my disposal by Mr. Outram Bangs, are plainly referable to ochraceus, though with a slightly darker, brighter dorsal stripe than the type." (Bailey, 1897: 124).

True gapperi, which does not reach Maine, has two color phases, while ochraceus apparently has only one.

Range in Maine:

In suitable localities throughout the state.

For Mount Katahdin, Dutcher states:

"Fairly common in the higher woods, up to 3500 feet, and probably on the lower levels too, though none were caught there." (1903:68).

In Brunswick, Cumberland County:

Found "in nearly all dry upland woods in this section, irrespective of the character of the growth, though it seems to prefer a rocky or ledgy soil." (Pope, 1922:25).

At Portland:

"I have taken this species in Dole's Woods, Portland, practically at sea level, and not more than five hundred feet from tide water." (Norton, 1930:75).

In regard to altitudinal distribution in New Hampshire, the following is interesting:

"The red-backed mouse (Clethrionomys gapperi ochraceus Miller) is the only abundant mammal of the alpine zone of the range. It was found under buildings on Mt. Washington, in stone fields, moss mats, scrub thickets, and on the shores of the Lakes of the Clouds." (Antevs,* 1932:99).

Life History:

"They live in cool, moist woods and brush lands, and seem to delight in the deepest shade and the cover of fallen leaves, tangled weeds, and half-decayed logs. Their nests are built in underground burrows, under logs, or under cover of old

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* Antevs is referring to the following paper by G. S. Miller, Jr.: "On a Collection of Small Mammals from the New Hampshire Mountains," Proc. Boston Soc. Nat. Hist., XXVI, 177-197. 1894.

leaves. A trap set under the edge of a half-rotten log in the woods is pretty sure to get a Red-back if a shrew does not happen along first. Though mainly nocturnal, they are sometimes seen in daytime. A rustling in the leaves and a quick brown flash are the usual evidences of their presence, unless one has the patience to sit for hours in the woods watching for them. I have surprised them by suddenly turning over a log and tipping them rudely out of their nests; have caught them in my hands as they scampered from their feeding grounds to their burrows, and have watched them gliding about among their favorite food plants.

"In winter these mice do not hibernate, nor have I ever found evidence of their storing provisions. They make long tunnels under the snow, through which they travel about with perfect security from a host of enemies, while they procure the tender grass blades and ripe seeds as easily from the surface of the ground as when the white blanket is not above them. All sorts of seeds and green vegetation are eaten, but grass is the favorite food, especially the half-blanched, tender base of the young grass blades." (Bailey, 1897:115-116).

In his account of the mammals of Brunswick, Pope writes:

"The habitats of this mouse and that of the common meadow mice are practically complimentary, the red-back is abundant in nearly all dry upland woods in this section, irrespective of the character of the growth, though it seems to prefer a rocky or ledgy soil. Microtus, on the other hand, confines itself to open grassy or bushy fields and pastures and such woods as are too wet for Evotomys [Clethrionomys], and shows a decided liking for runs and brook valleys.

"The breeding season of Evotomys [Clethrionomys] apparently includes a large part of the spring and early summer months as nearly grown young and females with embryos were taken early in June.

"In winter the red-back is inactive or, as I suspect, travels almost wholly under the snow. No specimens were taken between Dec. 10 and the time the snow was gone the following spring." (Pope, 1922:25).

Economic Status:

"As this is a woodland species disappearing with the forest, it has but little bearing on agriculture. The only mischief it embarks in is the girdling of forest trees, and this has never yet been observed on a scale large enough to be serious. Merriam remarks that its flesh "is tender and well-flavoured," which statement the lovers of wild meat may construe into a gentle hint." (Seton, 1909, I:512).

Microtus pennsylvanicus pennsylvanicus(Ord). Field Mouse; Meadow Mouse; Vole.

General Description:

"General characters.--Size medium ; tail at least twice as long as hind foot; fur long, overlaid with coarse hairs; ears moderate, conspicuous above fur in summer, almost concealed in winter pelage; colors dusky gray or brownish; skull long, well arched, and rather smooth; middle upper molar with four triangles and a posterior loop.

"Color.--Summer pelage: Upperparts dull chestnut brown, varying to bright yellowish chestnut, darkened along the back with coarse black hairs; belly dusky gray or tinged with cinnamon; feet brownish; tail dusky above, slightly paler below. Winter pelage: Duller and grayer throughout; tail indistinctly bicolor.

"Young: Blackish."

"Measurements.--Average of 5 adults from Washington, D. C.: total length, 171 [6.68 in.] ; tail vertebrae, 46 [1.79 in.] ; hind foot, 21.2 [.83 in.]."

"From Pennsylvania south along the Atlantic coast, specimens show a noticeable increase in size and intensity of coloration. . . while to the north they show a corresponding decrease in size and intensity of coloration, which reaches its extreme in the subspecies acadicus of Nova Scotia." (Bailey, 1900:17).

Range in Maine:

Found throughout the State, except for some of the outermost islands and possibly the tops of the higher mountains.

"It occurs plentifully, often abundantly, on most of the Islands of Casco Bay, though it is not found on the White Bull, the Inner and Outer Green Islands, the Junk of Pork, in Casco Bay, nor on Bluff Island in Saco Bay.

"The same absence has been noticed on most of the outermost Islands of the coast of Maine to the eastward." (Norton, 1930:75).

Mr. B. H. Dutcher, who collected mammals in and about Mount Katahdin from July 10 to September 2, 1902 states (1903: 68) thus:

"Contrary to expectations the meadow mice were rather scarce. When I arrived on July 10, the meadow lands available for their homes were many inches under water, and a search of the higher land revealed but few signs of any kind. A few were found along the rivers, one at 1500 feet, and one at Chimney Pond, at 3000 feet."

Blake also did not find this species at any great elevation on Mount Katahdin.

There is a great deal of variation in size in specimens of field mice from different parts of Maine. Howe (1900) described Microtus pennsylvanicus shattucki from Tumble Down Dick Island, near Long Island, Penobscot Bay, Maine. Wyman (1922:166) concluded that there were "no essential differences between the Penobscot field mouse and the common meadow mouse of the mainland."

The facts seem to be that, although Microtus pennsylvanicus pennsylvanicus, in general, tends to "decrease in size and intensity of coloration" (as quoted above from Bailey) to the north of the type locality, this condition is reversed and, coastwise and on the islands west of Penobscot Bay, the field mice become decidedly larger. Apparently the largest specimens come from Grand Manan, for Wyman states (ibid, 163) that: "The series from Grand Manan, New Brunswick, which I examined were at the upper limit for the size of the species." It may be said, then, that specimens from islands east of Penobscot Bay (and apparently the adjoining mainland also) undoubtedly average larger in size, the tail is longer, the ears may be more prominent, and certain skeletal variations are to be noted. It is a matter of how much weight one wishes to place on these characters.

Presumably, microtines taken west of the Penobscot River are smaller than those from the type locality, while east of the Penobscot it is still unknown as to how far inland specimens tend to average larger than those from the type locality.

Life History:

The meadow mouse is one of the best known rodents throughout the State. It is particularly abundant in old hayfields. In "haying time" it seems to be a practice of dogs and cats to prowl about the newly mowed fields and kill many of these voles, for at this time the mowing machine and the rake has removed their principal protection.

The runways of these mice are on the surface of the ground and, in reasonably "new" fields, consist of little more than a cutting away of the grass stalks which impede the progress of

the animals. In "old" fields, which are well cushioned with moss over the top of which the cutter bar of the mower passes, the mice are better protected for they have well made and intricate tunnel systems through this closely packed vegetation. Where these passages are numerous, one does not have to look closely to see a globular mass of fine dried grass, which has been pulled loose from its original position by the hay rake of the farmer and now shows conspicuously above the surface of the field. This is the nest of the meadow mouse.

The nests are of rather uniform material throughout, although the lining of nests containing young may be of finer plant material. The writer has heard it said that, in olden times, these dry nests were collected and used for tinder in kindling fires.

The young are born during the warmer months of the summer and early fall and are naked. Their first pelage is decidedly darker than that of an old adult.

The writer has kept a number of these mice in captivity and they have proved amusing and instructive creatures. They are active at all hours, very untidy about depositing their droppings wherever they go, and capable of eating a considerable quantity of raisins or other sweets. They spend a good deal of time in cleaning their fur. On one occasion a second mouse was put into the cage which had already been occupied by a good-sized specimen for about two weeks. The cats that habitually spent a great part of their time sitting on the cage watching the mice finally frightened the newcomer sufficiently to cause it to run into the nest of the original owner, who promptly dispatched it by a few gashes behind one ear. The carcass was not immediately removed, but on the following morning I drove the live occupant out of its nest to find that it had not bothered to cover up the dead body, but had apparently passed its quiescent moments resting on it.

The "nest" for my captive mice consisted of a tin can with a removable cover and a hole cut in one side. This can was soldered onto one end of the wire cage. If the mouse became frightened, it ran quickly into this nest and stuffed up the hole with some of the numerous bits of paper which it had torn up and used for a nest lining. In the wild this species undoubtedly follows these same tactics in trying to avoid snakes and other enemies which may seek to enter its abode.

Captive meadow mice will drink water very readily and are not hesitant about walking or swimming around in their water supply.

Economic Status:

"The vole affords an important item in the diet of various hawks, of all owls from the small Acadian and Richardson's owls to the snowy and great horned owls, of weasels, skunks, and red foxes, and to some extent of crows, ravens and snakes. It is thus a most important species in the economy of nature, affording food for many useful animals, which act to hold in check a most prolific and destructive species. It is to a large degree diurnal in its habits." (Norton, 1930:77).

"In summer they feed on growing grass, clover, alfalfa, and grain, seeds, bulbs, root crops, and garden vegetables. In fall they congregate under shocks to feed on the grain, and in winter often do enormous injury to young or even well-grown fruit and other trees by gnawing off the bark on the base of the trunk and roots, sometimes in this way destroying entire orchards and nurseries." (Nelson, 1918:406).

Vernon Bailey (1900) devotes considerable space to the economic importance of meadow mice.

In Maine I have never heard of this species becoming a severe pest, but it is a common practice to wrap the bases of young apple trees to prevent the voles from gnawing the bark during the winter months, for the meadow mouse does not hibernate.

Microtus chrotorrhinus chrotorrhinus (Miller). Rock Vole; Rufous-nosed Meadow Mouse.

General Description:

"General characters - Size and proportions of pennsylvanicus except slightly smaller hind foot; ears larger; fur lax; conspicuously yellowish about the nose, ears and rump; skull comparatively thin-walled and smooth; dentition unique.

"Color.--Summer pelage (July 14): Upperparts bright glossy bister, lined with black hairs; nose to eyes dull orange rufus; hairs around ears and on rump yellowish; belly plumbeous; feet dark gray; tail grayish brown, slightly paler below. Worn, left-over winter pelage: Darker and more rusty above."

"Measurements.--Type: Total length, 165 [6.44 in.]; tail vertebrae, 45 [1.78 in.]; hind foot, 19.4 [.75 in.]. Average of 4 adult topotypes: 170 [6.64 in.]; 48 [1.87 in.]; 19.6 [.76 in.]." (Bailey, 1900:58).

Distribution in Maine:

At present known only from Mount Coburn, Somerset County, where three specimens were secured by Leland C. Wyman in the summer of 1922.

Life History and Habits:

The following is Wyman's note in the Journal of Mammalogy (1923a:125-126), quoted entire. It is the sum total of what is known about this Hudsonian species within this State.

"While collecting small mammals on Mount Coburn in Somerset County, Maine, last summer I took in my traps three specimens of Microtus chrotorrhinus (Miller). So far as I can discover this is the first record for this species in the State of Maine. I believe that the only other recorded localities in the United States are the type locality, Mount Washington, New Hampshire, and the Catskills, New York. Mount Coburn is considered the third highest peak in Maine, being around 4500 feet. It lies in Somerset County, partly in township No. 2, range 6, and partly in Enchanted Township, being about twelve miles north of The Forks and about three or four miles south of Parlin Pond. It has a single high peak with numerous spurs and foothills, the whole being heavily wooded. One specimen was taken near the camp of the lookout at an elevation of approximately 3000 feet. At this place there is a moderate growth of spruce and fir with occasional birches and much underbrush. The ground is rocky and at the spot where the mouse was trapped the rocks are heaped up so as to form large holes and spaces beneath them. They are covered with moss and the whole is very damp. A few feet away there is a spring and a small, trickling stream. The other two specimens were taken on the top of the mountain. The top is covered with a dense growth of scrub spruce and fir, so dense that it is difficult to make one's way through it. The ground is entirely composed of fragments of rock, averaging two or three feet in diameter, which are piled on one another leaving large spaces between and below them. The rocks are entirely covered with moss and the whole locality is very damp. The character of the ground agrees almost exactly with the description of the type locality and of other mountain localities.

"The three specimens of chrotorrhinus were trapped on August 18, August 30, and September 1, respectively. All are males. The measurements are as follows: total length 169 mm. [6.60 in.], tail 47 mm. [1.83 in.], right hind foot 22 mm. [.86 in.]; total length 137 mm. [5.35 in.], tail 47 mm. [1.83 in.], foot 23 mm. [.90 in.]. I have compared them with topotypes from Mount Washington and with specimens from Quebec and found them to be similar to these specimens in all respects. The species did not appear to be very abundant on Mount Coburn. I had a line

of about fifty traps set for twelve days at the lookout camp locality and for five days on the top of mountain but only caught the three specimens mentioned. One peculiar circumstance that I noticed was the fact that every morning I found about half of the traps which were set in the holes under the rocks on the top of the mountain sprung with nothing in them. Such a thing rarely happens in other localities. One of the two specimens caught at the summit was not in the trap but had been hit on the nose and killed when the trap snapped. Whether or not this means that Microtus chrotorrhinus is too quick or too clever for the trap I would hesitate to say.

"The present known extent of the range and this newly recorded locality makes it seem likely that Microtus chrotorrhinus exists on other mountains in Maine. Mount Katahdin would seem to be an ideal locality for the rock vole. The big Maine woods are by no means exhausted as a field for the mammalogist."

Stone (1904:118) has the following to say about this vole.

"Of the habits of the rock voles but little is known. Mr. Miller found them in the White Mountains living in the crevices of rock mounds overgrown with sedges and bushes, and they seemed to have no regular runways. In New Brunswick Mr. Bangs states that they live in the deep spruce forests and appear to be diurnal in habits."

It seems to the present writer that this species ought to be taken sooner or later at a very few other localities in Maine than Mount Coburn. Katahdin is a good possibility. However, it should be borne in mind that although Mount Katahdin, for example, is about one degree of latitude north of Mount Washington (the type locality), there is far less Hudsonian area on this Maine peak. This is true to an even greater extent of the other peaks within this State.

There is also the possibility that chrotorrhinus in Maine may be found in spruce forests outside of the limited Hudsonian areas.

Dutcher, who covered the Katahdin region quite thoroughly in 1902, did not secure this species. He states (1903:171): "From the species of mammals found it is evident that the entire Katahdin region is covered by the Canadian mammalian fauna, with the possible exception of Synaptomys sphagnicola Preble."

Economic Status:

Distribution too limited to permit this species to be of any economic significance, even as food for predators.

Ondatra zibethica zibethica (Linnaeus). Common Muskrat; Water Rat; Musquash.

General Description:

"A large Rat with robust form; short legs; broad feet, specialized for swimming, hind feet partially webbed; tail long, laterally compressed, scaly and sparsely haired; ears scarcely showing above fur; pelage dense and composed of two types of hair, a close, waterproof underfur and longer, glistening guard-hairs; perineal glands strongly developed and secreting a pronounced musky odor; always living near water." (Anthony, 1928:442).

"Color.--Fresh pelage: Upperparts mummy brown, darkest on head; back glossy; sides chestnut to hazel. The darker color on back is due to the blackish overlying hairs, the color of the fur being much like that of sides. Underparts like sides but paler, approaching tawny, shading to whitish on throat and belly; a small spot on chin and hair of wrist and heel blackish; lips straw yellow; underfur light slate gray; nasal pad and tail black; feet dark brown; nails pale straw to brown. Worn pelage: Paler and duller throughout; upperparts and sides uniform grayish brown, or with a faded reddish mixture; back and head with little or no black. Black phase: Upperparts uniformly black; cheeks and long hair at base of tail chestnut; underparts dark. Young: Back uniform dusky; sides and belly paler; cheeks rusty." (Hollister, 1911:16).

Hollister (ibid., 17) gives the following average measurements of 7 adults from Lake George and Peterboro, N. Y.: Total length, 563 [21.99 in.]; tail vertebrae, 254 [9.92 in.]; hind foot, 81 [3.16 in.].

Weight.--About 2 pounds.

Range in Maine:

Common to abundant, depending on the locality, throughout the State.

Life History:

"As might be expected from the muskrat's extensive distribution, its habits vary considerably with local conditions. Over the greater part of its range it is noted as a builder of marsh houses, and these heaps of aquatic vegetation are a characteristic feature of the marsh landscape. The houses, chiefly for winter shelter, are sometimes of great size, though

commonly the home of a single family. The nest chamber is in the center of the heap, above water line, with tunnels for entrance and exit running out below the surface. Not all muskrats, build houses. Where abrupt banks take the place of low, marshy shores, many of the animals seem to prefer holes in these banks. In this case the burrows extend from an underwater entrance through the bank to a dry nest chamber, near the surface, above high-water mark. In many places muskrat houses are unknown, all the animals living in these bank homes.

"By far the greatest part of the muskrat's food is vegetable matter, and many kinds of aquatic and shore-growing plants help make up its bill of fare. It often travels a considerable distance from water at night to feed on some especially favorite food. There is good evidence that the muskrat sometimes eats animal matter, fresh-water mussels especially, and occasionally fish, dead birds, and other animals. . . .

"Breeding habits doubtless vary somewhat with climatic conditions. Prof. D. E. Lantz, after calling attention to the wide variance in the published accounts of the breeding habits of the muskrat, gives information from the best-informed trappers in Maryland. The most reliable evidence shows that in this region from 3 to 5 litters (normally 3) are produced annually, and that the number of young in a litter varies from 3 to 12, or even more, the average being probably 6 or 8. The young of early spring litters are said to breed the fall of the same year. . . ." (Hollister, 1911:9-10).

For the Portland region Norton (1930:78) states thus:

"The well-known winter houses are usually built during the month of October. Mating has been observed in the third week of April. . . ."

The muskrat does not hibernate, but is active throughout the year.

Regarding their time of activity and habitat Anthony (1928: 448) states as follows:

"Muskrats, when undisturbed, may be seen moving about at any hour, but the best times for observation are early in the morning and, more especially, just before sunset. They are expert swimmers and travel in the water in preference to running on the ground, although they may go overland to quite a distance for some favorite article of food. Still or slow-moving water is best suited to their mode of living, but I have seen a Muskrat in a swift, white-water, mountain creek in the autumn when, perhaps, it was seized with a wanderlust and was seeking a new home site."

For a full and valuable account of the muskrat see The Muskrat in New York: Its Natural History and Economics, by C. E. Johnson (1925b).

Economic Status:

"The great and ever-increasing demand from the furrier and the consequent rise in price of muskrat skins make the animal one of great economic importance. . . .

"While the damage the rodent inflicts on crops is not severe, it sometimes destroys grain and vegetables for a limited distance from the water's edge. The chief complaint against it, however, is on account of the injury it does by burrowing into dams and embankments of ditches and levees. Instances of serious loss to property from this source are numerous, and in certain places unceasing warfare against the burrowers is necessary. In most localities, however, the animal's value as a fur bearer justifies its protection throughout the breeding season and the months when its pelage is not at the very best." (Hollister, 1911:10-11).

The muskrat is eaten by the Penobscot Indians.

See also Lantz, 1917.

The average annual catch of muskrats, as reported by Maine trappers, and computed over the eight-year period of 1928-1935, inclusive, was 33,112 pelts. The annual catch for these years has been as follows:

1928 . . .	47,854	1932 . . .	34,347
1929 . . .	34,564	1933 . . .	24,713
1930 . . .	12,127	1934 . . .	36,173
1931 . . .	47,009	1935 . . .	38,000

Family Zapodidae

Subfamily Zapodinae (Jumping Mice)

Zapus hudsonius hudsonius (Zimmermann). Hudson Bay Jumping Mouse; Kangaroo Mouse.

General Description:

"A medium-sized Mouse with greatly elongated hind legs; very long, slender, tapering tail; short forelegs, ear not reaching much beyond surrounding pelage; color yellowish brown

above, white below; pelage long and somewhat coarse when compared to that of the White-footed Mice or Meadow Mice; throughout most of its range hibernating in winter; when alarmed progressing by long leaps.

"Color.--sexes colored alike.

"Upperparts (summer) mixed yellowish fawn and black, pelage slate-colored at base and only tips of hairs colored; a dark dorsal band from crown to base of tail where black-tipped hairs predominate; tail above, grayish brown, below, white, a sharp contrast between the two surfaces; feet white; underparts white, sometimes tinged with color encroachment from sides.

"Winter pelage duller, yellower, and with less contrast between color of sides and dark dorsal band.

"Immature pelage more ochraceous than adults, and more apt to show fulvous wash on underparts.

"Measurements.--Sexes of equal size, total length, 8.7 in. [228 m.m.]; tail vertebrae, 5.3 in. [136 m.m.]; hind foot, 1.2 in. [31 m.m.]." (Anthony, 1928:458-459).

In Proc. New Eng. Zool. Club, I, pp.3-7, Feb. 8, 1899, Charles F. Batchelder described "Some Unrecognized Jumping Mice of the Genus Zapus." Zapus hudsonius hardyi from Mount Desert Island was described as new; this name has been relegated to synonymy in Miller's List of North American Recent Mammals, 1923.

A few paragraphs of interest are here quoted from Batchelder's paper.

"Recent writers generally have assumed that Zapus hudsonius was so little susceptible to variation that, throughout the eastern portion of its range at least, the name hudsonius of Zimmermann was everywhere applicable, even in a subspecific sense.

"Examination of extensive series of specimens from a number of localities in the Atlantic States and Canada shows, nevertheless, considerable geographical variation, and brings to light several subspecies that have been overlooked within this area." (P.4).

"A comparison of Z. h. canadensis* with a jumping mouse found on Mt. Desert Island, Maine, shows the latter to differ in so many respects that I am led to distinguish it as Zapus

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* Type locality given as near the city of Quebec.

hudsonius hardyi subsp. nov. Type from Mt. Desert Island, Hancock County, Maine; taken August 24, 1898, by C. F. Batchelder; adult ♀, no. 1597, coll. C. F. Batchelder.

"Subspecific characters.--Similar in color pattern to Zapus hudsonius canadensis. The dark area of back and head is blacker and the buffy of the sides paler, than in that subspecies. The white of the under parts is purer, especially on the throat, the hinder part of belly, and inside of thighs. The upper surface of the hind feet is silvery white, instead of pale grayish as in Z. h. canadensis; there is a similar though less difference in the fore feet. The under side of the tail (at least in dried skins) is much more distinctly white as contrasted with the pale gray of canadensis. . . .

"Ten adults (four males and six females) yield the following average measurements: total length, 223.5 [8.73 in.]; tail vertebrae, 137.6 [5.37 in.]; hind toe, 31.8 [1.24 in.]; ear, 18.3 m.m. [.71 in.]." (P.5).

Range in Maine:

In suitable localities throughout the State.

At Katahdin:

"Found in all suitable localities from 500 feet to 3000 feet altitude." (Dutcher, 1903:69).

At Brunswick:

"No specimens of this better known jumping mouse were taken in 1909-10 but two or three from the vicinity are preserved in the college collection. Two were taken at Coffin's Pond by the class in Field Zoology, May, 1921" (Pope, 1922:61).

For the Portland region:

"Though well distributed, this species seems to be found in scattered colonies, where it occasionally becomes quite numerous." (Norton, 1930:79).

Preble (1899:18) lists specimens from the following stations:

"Walker Pond, 4; Mount Desert Island, 4."

Batchelder, in his paper quoted above, cites (page 7) 47 specimens from Madawaska, which are described as intermediate between the Zapus hudsonius canadensis and Z. h. hardyi of that author. They are said to be nearer the latter form.

Life History:

The life history of the Hudson Bay Jumping Mouse is very similar to that of the Woodland Jumping Mouse, so the reader is referred to the account of the latter form.

Economic Status:

Of no importance, except possibly as food for predators.

Napaeozapus insignis insignis (Miller). Woodland Jumping Mouse.

General Description:

The distinguishing features between Zapus and Napaeozapus are (1), the absence of a premolar in each upper jaw and, (2), the presence (usually) of a white tip on the tail in the present genus. Otherwise the two genera are very similar in appearance.

"Size rather large, larger than Zapus hudsonius, with longer ears and paler, more fulvous coloration. Tail tipped with white." (Preble, 1899:33).

"Upperparts buff-yellow, lightly sprinkled with black, bristly hairs; color clearer on cheeks, neck, and narrow lateral line; dorsal band with black predominating, well defined; tail sharply bicolor, dark brown above, white below, tip white above and below; feet white; underparts white.

"Total length, 9.5 in. [243 m.m.]; tail vertebrae, 5.8 in. [148 m.m.]; hind foot, 1.24 in. [31.7 m.m.]." (Anthony, 1928: 463).

Range in Maine:

Apparently locally common nearly everywhere.

At Katahdin:

"About as common as, and found in the same meadows with Zapus." (Dutcher, 1903:89).

For Portland:

"We have not met with this woodland species, though this region is within its range. Pope found it locally about Brunswick." (Norton, 1930:79).

Said to be "uncommon" on Mount Desert Island by Branin (1936:174).

Life History:

The following paragraphs are extracts from an article on Zapus and Napaeosapus in Nova Scotia (Sheldon, 1934:290-300):

"Zapus seems much more adaptable as to habitat than Napaeozapus. It is most abundant on hay meadows where the grass is thick and tall most of the summer. However, it was taken also along grassy swamps. Although in the hay meadows it seems to inhabit only the land near the lake shore it was found also two or three miles from the lake in clearings filled with sweet fern, pearly everlasting, hay-scented fern, and other plants that grow in a fairly dry habitat. The farmers in Nova Scotia report jumping mice to be commonly seen during haying operations. I have never caught them out in the open, but only around the edges under bushes. However, they are known to use the shelter of haystacks." (p.291).

"My observations confirm the suggestion of W. E. Saunders in the November, 1921, number of the Journal of Mammalogy, that these mice may be partly arboreal in habits. I have found that both Napaeozapus and Zapus climb bushes with surprising sureness and agility. They climb all over the small evergreen trees in their cages, chasing each other among the branches, or often sitting on one of the limbs for five or ten minutes without moving, their long tails hanging down below them. The Zapus clamber over the rose bushes in their cages, the thorns apparently not hindering them. The Napaeozapus not only eat older cones, which in nature grow two or three feet off the ground, but also the new green needles of spruces which, although sometimes available from very low branches, must require some climbing ability. . . ." (p.293).

"Other daytime records for jumping mice include a Zapus seen in a field at midday and a Napaeozapus observed by my brother in an open bog during the day. Fairly often both species are seen abroad in the late afternoon and early evening. I have never found them to be very active in rainy weather, almost never catching them in traps at such times." (p.294).

"When eating, both species of mice squat on their hind legs and tail and hold the piece of food in the fore-paws. Apparently they bit off a seed, then hold it in their fore-paws, and transfer it to the mouth. . . ." (p.295).

"The times of breeding have not been exactly determined by me. One Napaeozapus in captivity in June of 1925 contained 4

young, another 2, and a Zapus had only one. In 1930 a Zapus caught June 13 contained 6 young; a Napaeozapus caught June 26 contained 3. A Napaeozapus caught in a snap trap on June 20, 1933, contained six young in a very primitive stage. In 1933, four different captive Napaeozapus gave birth to litters - one of 5 on June 29, one of 5 on June 30, one of which I do not know the number on July 2, and a litter of 2 about September 11. The indication is that during the breeding season in Nova Scotia, each female probably has more than one litter." (p. 296).

"At birth the young Napaeozapus were dark pink and hairless with eyes and ears closed. Those taken from the first two litters each weighed just one gram." (ibid.).

Regarding the time hibernation commences, Manlif (1936:5) has the following to say:

". . . It seems probable though that the normal period of activity of the jumping mice on Mount Desert Island extends to around the first of October. The Woodland Jumping Mouse, Napaeozapus, has not been taken on the island later than September 7. . . ."

Manlif then goes on to sum up the data on specimens possessed by Mr. Norton, Dr. Copeland, and the Museum of Comparative Zoology. Dr. Allen and Mr. Norton reported no September specimens. Dr. Copeland reported no Napaeozapus, but eight specimens of Zapus hudsonius in the Bowdoin College collection taken after September 15. The latest date is for a Manchester specimen taken on October 19, 1915.

"During hibernation they are coiled up in little furry balls, the nose resting on the abdomen, the hind feet on each side of the head, and the tail wound around the body. The winter sleep usually lasts until spring, but may be broken at any time by mild weather." (Nelson, 1918:395).

Economic Status:

Of no importance, except as food for predators.

These mice are nowhere numerous, being found usually only in scattered colonies of six or eight individuals.

Family Erethizontidae

Erathizon dorsatum dorsatum (Linnaeus). Porcupine; "Hedgehog."

General Description:

"A large, clumsy rodent with long, sharp spines in its pelage. Head proportionately small; muzzle blunt; lips hairy; body thick and heavy; limbs rather short; four claws on fore-feet, five on hind feet; tail short, thick, muscular; pelage composed of fairly long, soft, wooly hair with which is mixed much longer, hard, glistening hairs and long spines; spines stiff, sharp, and barbed, and occurring all over upperparts from crown of head and sides to end of tail; underparts spineless; gait plantigrade.

"Color.--Sexes colored alike; no very marked seasonal variation.

"Everywhere slaty black, or brownish black to black, liberally sprinkled on upperparts and sides with light-tipped hairs which are whitish to yellowish white; spines yellowish white tipped with black; spines most conspicuous on rump and tail, more or less concealed elsewhere; incisors orange-red.

"Immature like adults.

"Measurements.--Sexes of equal size. Total length, 34-40 inches [922-1024 m.m.]; tail vertebrae, 6 inches [154 m.m.]; hind foot, 3.5-4 inches [89.6-102.4 m.m.]; weight, 15 to a maximum of 35 or 40 pounds when excessively fat." (Anthony, 1928:465-466.

"The number of years a porcupine lives after reaching the age when it can reproduce itself is not known. After the third year the animals still continue to grow until they reach an average weight of fifteen pounds. Two-thirds of the porcupines taken by the writer have weighed twelve pounds or over. The largest female weighed eighteen pounds, while four males each weighed over nineteen pounds and varied in total length from 29 to 35 inches. Adult males average to weigh two pounds more than females. . . ." (Struthers, 1928:305).

Range in Maine:

Locally rare to abundant.

Life History:

"During a large part of the year porcupines, both male and female, live together without any discrimination of sex. In the large colonies the number of animals occupying a certain den seems to depend upon the amount of space available and the physical advantages of the den. The writer has taken fifteen porcupines from the opening into one den within a week and in 1925 nineteen were killed in a den, which has an opening sufficiently large for a man to pass through. The occupants of a den one day may spend the next day in a different den within the confines of the colony. In feeding, an animal follows the main run as far as the feeding grounds and then selects its own tree on which it feeds. The porcupine does not hibernate, so that during the winter the activities of the animal can easily be observed by studying their tracks after a new fall of snow.

"The mating of porcupines begins the first week in November and is generally finished by the first of December. Seventeen adult females taken between November 21 and 25 showed only three that were not pregnant, while twenty-six females taken between December 20 and 25 showed only one that was not pregnant. This is probably the only mating season of the porcupine, for many females taken during the summer have in no case shown signs of pregnancy. . . ." (Struthers, 1928:301).

"The gestation period of the porcupine is sixteen weeks. The authority for this statement is based on the record of the captive female that was fertilized January 20 and delivered her young May 13. Observations made by residents of Nelson, New Hampshire, say that the young of the porcupine are born in March, which also confirms the statement.

"Female porcupines as a rule carry but one young. Of the fifty-one pregnant females that the writer has examined, only one has contained more than one embryo. . . . In spite of the statement of recent authors. . . that the porcupine rears from one to four young a year, I agree with Cuvier, . . . who reports but one young a year." (Ibid., 303).

"The observations on the young at birth are taken from the individual born in captivity. This animal weighed 510 grams and its total length was 27 centimeters. Its eyes were open and the tips of the incisor teeth just showed above the lips. Its body was sparingly covered with long grayish-black hairs, especially on the anterior half. On the second day the needle-like tips of the quills could be felt and at the end of a week they were about one-quarter of an inch long. Six hours after birth the porcupine could waddle about the cage and on the second day it climbed to the top of the pen, some six feet from the floor. From the first the infant was extremely wild. Later during the summer Doctor Graham, with the greatest of patience,

endeavored to conquer this inherent fear but without success, although the mother became so tame that she would climb up on his knee to be fed. For a week it nursed its mother and then began to eat the regular diet of bread and apples. The most remarkable thing about this young animal was the rapidity with which it passed out of the period of helplessness. Within a day it could flee from danger and in a week it no longer needed food from its mother. On the first day of life it would turn its back to an imaginary enemy and hit with its tail, although the quills were not as yet in evidence." (Ibid., 304).

"Porcupines are solitary animals, totally devoid of any qualities of good fellowship with their kind, but the attraction of woodland camps often brings a number together. They are exceedingly fond of salt and persistently return to camps to gnaw logs, boards, or any other object having a salty flavor.

"They appear to be practically omnivorous so far as vegetable matter is concerned and feed upon the bark and twigs of spruces, hemlocks, several species of pines, cottonwoods, alders, and other trees and bushes. In orchards and gardens near their haunts they eat apples, turnips, and other fruits and vegetables and visit the shores of ponds for waterlily pads and other aquatic plants growing within reach." (Nelson, 1918:394).

Wyman (1923b) tells of the damage to an automobile done by a porcupine at Mt. Coburn, Somerset County.

Economic Status:

Porcupines are very destructive to trees.

"Ordinarily they eat patches of bark from the tree trunks, but sometimes girdle the tree or denude the entire trunk. . . ." (Nelson, ibid.).

In Maine a twenty-five cent bounty was paid on porcupines from 1903 to 1904 and from 1927 to 1932. The bounty was paid on animals from the "forestry district," October 15 to April 1; in the rest of the State it was paid all the year.

Key to Maine Rabbits and Hares (Order Lagomorpha)

A1 Ears tipped with black at all seasons; pelage brown in summer and white in winter; hind foot 125 m.m. (f.9 in.) or more; generally distributed throughout state. Varying Hares.

- B1 Length 500-525 m.m. (19.5-20.5 in.); summer pelage bright rusty ochraceous brown. Virginia Varying Hare.....*Lepus americanus virginianus* (P. 126)
- B2 Smaller, length about 475 m.m. (18.6 in.); coloration not so bright. Nova Scotia Varying Hare.....*Lepus americanus struthopus* (P. 125)

A2 Ears never tipped with black; no seasonal color change; hind foot less than 100 m.m. (3.8 in.). Northern Cottontail.....*Sylvilagus transitionalis* (P. 130)

Order LAGOMORPHA

Family Leporidae (Hares and Rabbits)

Lepus americanus struthopus Bangs. Nova Scotia Varying Hare; "Rabbit"; "White Rabbit"; "Big Rabbit."

General Description:

"General characters.--Size nearly the same as in americanus but ears longer; color similar to virginianus but duller and browner; skull smaller and slenderer.

"Color in summer pelage.--Top of head and upperparts of body cinnamon brown or cinnamon buffy brown, brightest on head and darkened with a wash of blackish on back; sides of head deep cinnamon, sometimes around eyes and sides of nose almost deep dull ochraceous buffy; sides of body clearer cinnamon brown than back and often becoming rusty or slightly reddish cinnamon brown on fore feet and legs, and a duller shade of same along lower border of flanks, front of hind legs and tops of hind feet; front of ears on outside similar to top of head, but a black border near tip; inside of ears more or less cinnamon brown or rusty brown with a border of same in front and border of whitish posteriorly; top of tail blackish; underside of neck similar to sides of flanks or a little brighter more rusty cinnamon; rest of underparts white, sometimes with color of lower flanks spreading over the borders of abdomen; underfur dull dark, slightly ochraceous buffy brown underlaid with plumbeous; in winter same as virginianus. (Nelson, 1909:90).

"Average measurements (5 adults).--Total length, 474 [18.51 in.]; tail vertebrae, 52 [2.03 in.]; hind foot, 129 [5.04 in.]; ear from notch in dried skin, 66 [2.58 in.].

"Remarks.--This rather poorly marked subspecies, an intergrade between virginianus and americanus, is typical only in Nova Scotia and adjacent parts of New Brunswick. Specimens from northern New Hampshire and Western Maine are similar to struthopus in their small size, but are so highly colored that they must be referred to virginianus. . . ." (Loc. cit.).

Range in Maine:

The complete range of this subspecies is given by Nelson (ibid.) as follows:

"Maine, east of Penobscot River, Nova Scotia, New Brunswick, eastern Quebec (south of lower St. Lawrence and including

Magdalen Islands), and Newfoundland. Vertical range, from sea level up to over 2,500 feet altitude in New Brunswick; zonal range, Canadian."

Nelson lists Maine specimens from Bucksport, Enfield, and Grand Lake.

Life History and Economic Status:

See the account under L. a. virginianus.

Many hares are taken alive in Washington County, which is within the range of this subspecies, and are transported elsewhere for restocking purposes.

Lepus americanus virginianus Harlan. Virginia Varying Hare; "Rabbit"; "White Rabbit"; "Big Rabbit."

General Description:

"General characters.--Largest, and in summer the brightest and most richly colored, form of americanus. Upperparts usually some shade of rusty ochraceous brown varying in a small percentage of specimens to a duller, more buffy brown. Skulls of typical specimens from Pennsylvania and south average distinctly larger and more massive than those from farther north, where they grade into the smaller americanus and struthopus.

"Color of summer pelage.--Entire upperparts of head and body nearly uniform dull rusty brown or ochraceous brown, varying to buffy brown, always more or less darkened by a wash of black, heaviest on the back; legs and feet commonly clearer and brighter rusty than body, and often clear bright rusty rufous, but like ears are mingled whitish and rusty later in spring and earlier in fall than body, ears on basal half in front like head, but becoming darker brownish or even blackish on terminal half; posterior half of ears on outside whitish or gray, changing to a more or less well marked blackish border about tip; inside grayish with grayer border in front and pure white border along posterior margin; a dusky margin sometimes present on terminal fourth of anterior border; nape similar to back but duller; rump rather more heavily washed with black than back; top of tail blackish or dusky brown, underside white or grayish; underside of neck and a narrow line along lower border of flanks and legs very rich bright dusky rufous, clearer and brighter than back, and always brighter and more rusty than upperparts, even in the duller colored specimens; rest of underparts pure white; underfur

rich dark ochraceous buffy underlaid with an equal basal zone of plumbeous.

"Winter pelage.--In southern part of their range sometimes pure white with a little dusky about tips of ears, but commonly with more or less dull rusty brownish on feet and terminal half of ears; the surface layer of white over back rather thinner than in americanus; underfur dark buffy or dull rusty ochraceous buffy underlaid with a plumbeous zone of about equal width.

"Skull.--Much larger and more massive than in either americanus or struthopus. . .

"Average measurements (5 adults).--Total length, 518 [20.23 in.]; tail vertebrae, 49 [1.91 in.]; hind foot, 141 [5.50 in.]; ear from notch in dried skin, 66 [2.58 in.]." (Nelson, 1909:93-94.)

Under remarks the same writer adds the following, pertaining to Maine specimens:

"Specimens from the central part of New Hampshire and from various points in Maine as far east as the Penobscot River and Mount Katahdin are nearly all bright ochraceous rusty on the feet and upperparts, and thus must be classed with virginianus, although the skulls are small and slender, closely like typical struthopus, just as a few specimens among the large series from northern New York are colored like americanus."

"Varying Hares may be distinguished from Cottontails by larger size, longer hind legs, larger hind feet, no white underside to tail (in brown summer pelage), and white winter pelage; in the summer pelage the Varying Hares are generally a duller brown than any of the Cottontails." (Anthony, 1928:482-483.)

Range in Maine:

We are at the northern limit of the range of this subspecies, for Nelson (page 92) states that its territory covers from the mountains of West Virginia up to and including "most of Maine east to Penobscot River and Mount Katahdin. . . "

He cites (page 95) specimens from the following Maine localities:

Bethel; Greenville; King and Bartlett Lake (30 miles south of Rangeley Lakes); Mount Katahdin; Sandy Stream Pond; Sebec Lake; Upton.

Regarding this hare at Katahdin, Dutcher (1903:39) writes thus:

"The varying hare occurs on the tableland, where I trapped one in an old caribou trail in July. It corresponds with specimens obtained at 1500 feet, and all are comparable with other examples of L. a. virginianus in the Biological Survey Collection."

Life History:

"The Varying Hares are so named from the fact that the pelage varies with the season, brownish in summer, white in winter. Although the transition seems to be rapid, and it was formerly supposed to be a change in color of the hair itself, the new pelage is the result of molt or shedding followed by a growth of new hair. In fall and spring, specimens may be secured in which the pelage is particolored, brown and white." (Anthony, 1928:483).

"The spring moult becomes noticeable late in March and continues well into April. The fall moult takes place in November and continues into December." (Norton, 1930:81).

C. M. Aldous (1937) has an important paper on the snowshoe hare in Minnesota. Regarding the size of litters of L. a. phaeonotus, he writes as follows (pp.47-48):

"The size of the litters of 36 observed females showed the average to be 2.4 young. If the normal yearly number of litters is assumed to be two, and the normal number of young per litter 2.5, the yearly increase per breeding would be 5 young."

"The young of the snowshoe hare are born with a coat of hair, the eyes are open, and the young are capable of moving about clumsily a short time after birth. After the second day they can move about quite freely when disturbed, although if not molested they prefer to sit in a huddle perfectly quiet, more or less oblivious to everything about them. Their rate of growth after birth is very rapid, the hares doubling in weight in about 8 days, trebling in about 12 days, and increasing to more than 9 times the weight at birth at one month of age. Grange. . . determined that for a period of 159 days after birth a young snowshoe hare made an average daily gain of 9 grams.

"The instinct for self preservation is well developed in very young hares, for when disturbed while resting in a group they readily scatter to conceal themselves among the débris, and assume freezing positions, a habit which makes it very difficult to find them. A few hours after their dispersal, however, the litter usually has assembled at the place from which they scattered. The mother seldom interferes or is concerned when the young are handled or removed from the pens. It is believed that the period of parental care is short, a theory corroborated by the fact that a second litter may be born when the first is but 47 days old. From our breeding observations in Minnesota we are

inclined to believe that the young are completely weaned by the time they are a month old. . . ." (Ibid., 49-50).

J. Dewey Soper (1921) has some very interesting observations on the snowshoe rabbit in Canada, while C. E. Johnson (1925) has a paper devoted to the jack and snowshoe rabbits as swimmers. The latter (page 246) mentions an observation by William Brewster at Lake Umbagog, Maine, in the summer of 1873. A rabbit was seen to swim the Cambridge River at a point where it was 100 feet wide and at least 8 or 10 feet deep. The animal "hopped" through the water and was quite worn out by the time it reached the opposite shore.

"In summer, owing to their nocturnal habits and the dense thickets they inhabit, varying hares are rarely seen unless they are unusually plentiful. In winter their presence is known by their conspicuous tracks, leading in every direction from their haunts. A single animal will in one night so thoroughly track the snow in a patch of woods it gives the impression several must have been there." (Nelson, 1918:387).

"They feed on a variety of small herbage in summer and in winter depend on buds, twigs, and the bark of shrubs and small trees. . . ." (loc. cit.).

Economic Status:

"They are serious pests to fruit growers on account of their fondness for the bark of trees and the tender growths of nursery stock. They also destroy young grapevines and garden crops. . . ." (Nelson, 1909:11).

"As an offset to the damage done by rabbits it should be stated that they have a high food value. They are the commonest and most widely distributed of our game animals, and during fall and winter countless thousands of them are sold in markets throughout the country. The total value of the rabbits thus sold in the United States, in addition to those consumed in the country, amounts to a large sum. It has recently been stated that about 2,000,000 varying hares are caught each winter in Maine, half of which are shipped out of the State." (Ibid., 12).

(See the remarks under Dice, 1927, in the bibliography. The same holds true for the snowshoe hare as for the cottontail; the transfer of breeding stock from state to state will ultimately upset the distribution of pure stock of the various subspecies.)

Regarding the use of snowshoe hares for sport in the Portland region, Norton (1930:80) states as follows:

"Hunting 'rabbits' with hounds has been a favorite sport for many years, and is still indulged in."

Sylvilagus transitionalis (Bangs). New England Cottontail; "Little Brown Rabbit"; "Coney."

General Description:

A smaller and more brownish animal than either of the two subspecies of Varying Hares found in Maine. No marked seasonal pelage change.

"Color in fresh pelage.--Upperparts of head and body usually bright pinkish buffy, varying to a deeper almost ochraceous buffy heavily overlaid with a black wash, the latter coarsely distributed and giving the effect of black streakings or pencilings; top of head with a narrow black patch between ears; sides of body less heavily washed with black than back and slightly paler pinkish buffy, often with a grayish wash; rump slightly duller buffy than back, but only indistinct traces of a paler rump patch; nape rusty rufous varying in intensity; top of tail rusty buffy brown, orbital area more or less strongly ochraceous buffy, rest of sides of head pale, slightly buffy, grayish; outside of ears dull ochraceous or slightly reddish buffy, washed and strongly margined with blackish; inside of ears with long whitish hairs on anterior border near base and elsewhere broadly margined with deep ochraceous, almost rusty, buffy; fore legs bright rusty rufous shading into paler, more ochraceous buffy on tops of fore feet; back and outside of lower hind legs and adjoining parts of outside of hind feet bright rufous, varying from a rich, almost bright, chestnut rufous to a light bright rusty, almost orange, rufous; tops of hind feet vary from bright whitish to pale buffy whitish; underside of neck varies from deep pinkish buff to a paler shade of same, and agrees closely with the clear deep pinkish buff along lower border of flanks.

"Worn pelage.--The rich buffy of the head and body fades to a much paler shade, and the rufous on legs becomes paler."

"Average measurements (5 adults).--Total length, 388 [15.19 in.]; tail vertebrae, 39 [1.52 in.]; hind foot, 95 [3.71 in.]; ear from notch in dried skin, 51.6 [2.02 in.]." (Nelson, 1909:196-197).

Range in Maine:

Found in southwestern Maine. This rabbit is gradually enlarging its territory in a northeasterly direction.

Norton (1930:81) states that the earliest Maine occurrence of which he finds record is for York County, in 1893.

It is interesting to note that G. M. Allen (1904:20) did not record the Cottontail in Maine, but reported it as "North to Webster" in New Hampshire.

Nelson (1909:196) included "extreme southwestern Maine" in its range.

According to Norton (loc. cit.) the Cottontail is gaining ground for he reports thus:

"Increasing steadily, it has moved constantly eastward, having reached Freeport in 1927."

The same writer adds a possible record for Ragged Island, in Casco Bay.

Life History:

The Cottontail is a burrowing animal, while the varying hares live in forms. Regarding this matter Nelson (1909:13-14) writes as follows:

"Taking the condition of the young a birth as a criterion, it thus appears that the term rabbit can be properly used in a general way to apply to all the species which have the burrowing habit more or less pronounced and which bring forth blind and naked young; while the term hare should be restricted to the species which practically always use forms instead of burrows and bear young well clothed with fur and with eyes open at birth. Common usage is thus correct in applying the term rabbit to the American cottontails and their small relatives of North and South America."

Anthony (1928:507) speaks thus of their breeding habits:

"Cottontails are very prolific and, in the warmer parts of their range, young animals may be found during any month of the year. Farther to the north the rearing of young is suspended during the winter months, but several broods a year is the general habit for this genus. Young Cottontails are able to take good care of themselves at an early age and are almost as difficult to run down and catch as the adults. The number of young in a litter varies from three to seven, with four as an average number."

Economic Status:

This rabbit is shot for food and for "sport" over that portion of the State where it occurs.

"Their food seems to be of much the same general character as that of the white rabbit though perhaps a little more varied, including fruit and all kinds of garden vegetables when convenient, though the damage done in this way is hardly worth

considering, in which respect it sets an example which the Old World rabbit might profit by." (Stone and Cram, 1904:77).

Order ARTIODACTYLA (Even-toed Ungulates)

Family Cervidae (Deer)

Subfamily Cervinae

Odocoileus virginianus borealis (Miller). Northern White-tailed Deer; Virginia Deer.

General Description:

"Bright rufous chestnut above in summer with a black band on the chin; throat, under parts and inside of legs white; tail brownish above, white beneath. In winter the upper parts are yellowish gray with white about the eye. Antlers curving outward and then upward, the tips curving in again toward one another; there is a short upright spike near the base, beyond which the beam gives off two upright branches making three nearly equal prongs. At no point does the antler branch dichotomously." (Stone and Cram, 1904:34-35).

Measurements:

Seton (1929, III:232) gives the measurements of a "fine adult male of the northern form" as follows: "Length, 6 ft. 5½ in. (1,965 mm.); tail, 11½ in (292 mm.); hind foot, 20½ in. (520 mm.); height at shoulders, 3 ft. 5 in. (1,040 mm.); body, ischium to manubrium, 4 ft. 3 in. (1,270 mm.); depth at chest, 16 in. (406 mm.); elbow to ground, 26 in. (660 mm.); length of head, nose to occiput, 13½ in. (343 mm.); length of ear, 9 in. (228 mm.).

"Weight. An average buck from Virginia would weigh alive about 150 lbs., and an average doe 100 lbs. But northward to the limit of the species, these weights may be doubled and, southward, they are 1/3 less."

Phillips (1920:130-133) has a valuable series of skull measurements of the Northern Virginia Deer.

The type locality of O. v. borealis is Bucksport, Maine.

Range in Maine:

Found in varying numbers in all suitable localities throughout the state.

For the Portland region, Norton (1930:82) states as follows:

"Though not numerous, the common deer is quite well distributed throughout the area and for the past ten years had been increasing slightly."

The abundance of this species is discussed below under "Economic Status."

Life History:

"This deer does not prefer dense stands of primeval forests, but delights in openings and glades interspersed with enough timber and shrubbery to give it adequate cover. The abandonment of worked-out New England farms has provided this animal with very acceptable homes and feeding grounds.

"The doe has from one to three fawns at a birth, but as a general rule she has twins. They are born from late May to early July.

"The bucks shed their antlers at any time from late December to March. The new antlers appear from two to six weeks after shedding, and grow rapidly as the spring feed improves. By late summer they have attained their full size, but are still in the velvet. In September the bucks begin to rub the velvet from the antlers which are now hard and insensitive.

"Mating takes place in late October, November and early December." (Anthony, 1928:520).

Henry Clapp, of Brownsville, (1868:666) wrote of the food of this species in Maine as follows:

"They browse "moose-bush", fir cedar (Arbor vitae), willow, swamp maple, and lynois bush; in summer they like lily-pads, leaves of trees, and grass[1]. . . ."

Thornton W. Burgess (1924:64-65) mentions some instances of deer in Maine eating trout caught by anglers. In one case a buck at "Dole Brook in the Moosehead Lake country" stole a trout that had been caught and hung up in a tree for safe keeping. In another instance, a doe at Allagash Lake stole about a dozen trout that had been left in a canoe which was drawn up on the bank.

Somewhere, the present writer has seen an account of a deer that actually caught its own fish (not trout) in shallow water. The source of this information does not seem to be a hand just now.

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1. "Moose-bush": Acer pennsylvanicum; Fir: Abies balsamea; Cedar: Thuja occidentalis; Willow: Salix spp.; Swamp Maple: Acer rubrum; Lynois bush: ?

Economic Status:

Deer have served for food for the inhabitants of Maine since time immemorial.

"That they were common in prehistoric times is attested by the presence of their remains in all the shell-heaps of this section [the Portland region]." (Norton, 1930:82).

The present use of deer for "sport", as well as food, is of growing economic importance to the State.

Open season and bag limit.

No legal protection was given to deer in Maine prior to 1830. Since then the open season has been as follows:

1830-39	September-December	(inclusive)
1840-47	November-June	"
1848-52	July-February	"
1853-69	September-January	"
1870-72	October-January	"
1873-92	October-December	"

From 1893 to date, the season has varied in different counties and is too complicated a picture to present here.

There was no season limit before 1873; the limit was three deer from 1873 to 1892. Two deer was the general rule from then up to 1925; one deer (of either sex) has been the legal annual bag limit since then.

Numbers present and numbers taken:

Since the advent of the white race, the number and distribution of deer in Maine seems to have varied a good deal, particularly in the northern half of the state.

"The official report for Maine gives 7,579 Deer killed in 1899, which we may believe makes a destruction of about 15,000 Deer. But they have ample room, and are steadily increasing, so I put the numbers existing in Maine to-day (1903) at not less than 75,000, or about two to the square mile. In doing so, I find I have been properly conservative, as Dr. W. T. Hornaday, in 1904, gives the estimate of Deer in Maine at 100,000, or 3 to the square mile.

"All records agree, however, that in numbers, the Deer in the Adirondacks and Maine now are as nothing to those of days gone by. Thus Morton says of those in New England about 1632: 'There is such abundance that 100 have been found, at the spring

of the year, within the compass of a mile'". (Seton, 1929, III: 245-46).

The same writer (ibid., 249) states as follows:

"In Maine, during 1913, 7,755 were legally killed implying a stock of 40,000."

Seton also mentions (ibid., 250) that 5,748 deer were killed in this State in 1920.

For comparison with the above quoted estimates on the former number of deer in this State, the following censuses made by the wardens are quoted. In regard to these figures, Archer L. Grover states*: "During each winter for the last three years, the wardens have taken a census of deer, moose, and beaver. . . . Because of the large number and wide distribution, the estimate on deer is probably the least accurate of the three."

1934	105,273
1935	96,826
1936	105,554

Number of deer killed annually in each county:

The following statistics are based on an average of the three hunting seasons: 1933- 34- 35. In all counties it is less than one deer per square mile.

Washington	88%	Waldo	42%
Hancock	75	Somerset	42
Penobscot	71	Knox	38
Oxford	60	Kennebec	35
York	56	Aroostook	34
Lincoln	50	Piscataquis . . .	31
Franklin	49	Sagadahoc	25
Cumberland	48	Androscoggin . .	23

Maine deer kill for 1936:

The total deer kill for the State for the 1936 hunting season cannot be accurately stated. The figure given to the press by the Department of Inland Fisheries and Game was 19,134. Of these, 16,815 were not tagged for shipment on the Bangor and Aroostook Railroad; of the 2,319 which were transported by the B. and A., it is not known how many were counted twice and so included in the count of 16,815.

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* See "Graphical Information regarding State of Maine Inland Fish and Game," compiled by Archer L. Grover.

These figures are carried "on the books" thus:

Bucks	9,759	
Does	6,984	
	2,319	(not designated)
	19,134	Total legal kill.

It is interesting to note, in this connection, that the number of hunting and fishing licenses sold from July 1, 1935 to June 30, 1936 are as given in the following tables. (The number of fishing licenses is stated for the sake of comparison).

25,897	resident combination (hunting and fishing) licenses.
72,642	resident hunting licenses.
65,304	resident fishing licenses.
163,843	resident licenses.

2,646	non-resident deer licenses.
1,156	non-resident bird licenses.
96	exchange (bird for deer).
8	junior deer licenses.
12	junior bird licenses.
3,918	non-resident hunting licenses.

For the same period, there were sold 30,044 non-resident fishing licenses. Of these the largest number were either 30-day or 3-day licenses. There were 13,700 of the former, 10,645 of the latter. The rest were season, junior, or exchange (30-day for season) licenses.

Alces americana americana (Clinton). Moose.

General Description:

"A crest of stiff erect hairs on the neck, much elongated and forming a hump on the shoulders, nose large, the upper lip protruding well over the lower, ears large, tail very short, legs long, a pendent mass of hair on the throat called the "bell." Colour blackish-brown above, grizzled with gray on the rump, shoulders and sides of the neck, under parts black, inside of legs and their entire lower portions quite gray, feet black, ears gray. Antlers broadly palmate, solid portion nearly two feet at the widest point, several tines project forward and the outer edge of the flat portion is fringed by an irregular series of points." (Stone and Cram, 1904:43).

Young--"Not spotted like fawn of the Virginia Deer; reddish brown in color.

Measurements--"Males: total length, 102-108 inches; tail vertebrae, 2.5 inches; hind foot, 31 inches; height at shoulder, 66-78 inches; average spread of antlers, prime adults, 52-58 inches; maximum or record antlers, 55-78 inches in spread; weight from 900 to 1400 pounds. Females: much smaller, about three-quarters the size of males." (Anthony, 1928:525).

Weight--In regard to accurate records of the weight of Maine moose Seton (1929, III:156) states as follows:

"S. L. Crosby, of Bangor, Maine, an undoubted authority, after weighing several moose, says: 'The heaviest Moose I ever weighed tipped the scales at 1,009 pounds net; and the blood and entrails would surely have weighed 250 to 300 pounds more'.

"By actual weight, I found that a 562-lb. bull Wapiti lost 120 lbs. when his blood and entrails were removed; so that Crosby's estimate appears fair, and his big Moose surely weighed nearly 1,300 lbs.

"A large Moose killed near Penadomcook, Maine, by W. I. Miller, Sept., 1892, dressed 1,123 lbs., equal to a live weight of over 1,400 lbs."

In 1868 Henry Clapp stated thus (page 385):

"The average weight of a moose's meat after it is dressed is four hundred to five hundred pounds. I have killed one which I think weighed, meat and hides, one thousand pounds."

Range in Maine:

This species, found typically in forests of the Canadian zone, was distributed throughout the State in early times. With the encroachment of civilization it was exterminated or driven out of the southern counties of Maine. In 1904 G. M. Allen recorded it for "northern counties" only, but of late years members of this species have straggled southward and Norton (1930:83-87) lists a number of occurrences in the Portland region.

Regarding the Portland region Norton states, in part, (page 85):

"It is a fact worthy of note that the females which have been seen in this vicinity, as well as in various other sections in the southwestern part of the state, during the last few years have been without young. This situation should be regarded with

alarm; rather than showing an increase in the numbers of these animals, these wanderers seem to indicate that some numbers of barren females are wandering restlessly about, far from the accustomed haunts of the species."

Seton (1929, III:151) points out that the range of the moose was more limited thirty years ago than today, for the enforcement of good game laws is permitting an increase in numbers over much territory where once it was near extermination.

Life History:

Henry Clapp, a hunter and trapper of Brownville, Maine, has recorded some very interesting data on moose (1868:663-665), which is here quoted.

"Moose move over but a small district in a winter's day, four or five miles; sometimes in a thaw they move farther. When their tracks are obliterated by the snow, I often track them in this way: I notice the side of the tree from which they have taken the bark. This is the first side of the tree they come to; they then moved on and took the bark from the first side they come to of another tree, and thus left a "blaze" behind them. Sometimes when the old cow lies down, the calf will eat the bark all around the tree, but this is not the rule. They seem to tear the bark up with the teeth of the lower jaw. Sometimes they may be found in the spring not more than a mile away from where they began in the fall.

"They like best the bark of moose wood (the small maple with dark striped bark), mountain ash, and swamp maple.[1] They take the bark of the mountain ash more than of any other tree: but they browse the twigs of the swamp maple most. They will also browse fir and willow and moose bush,[2] and sometimes cut the bark of poplar.[3] They also frequent ponds for the pond lily and the yellow lily.

"The largest herd I ever saw had nine in it, but they more often live in herds of four or five. The female brings forth two calves, and they stay with the old cow the summer and winter following. The males more often yard by themselves but are sometimes found with the female. The sexes come

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1. Moose wood: Acer pennsylvanicum.
   Mountain ash: Sorbus americana.
   Swamp Maple: Acer rubrum.
2. Moose bush: ?
3. Poplar: Populus tremuloides.

together about the last of September or the first of October, say from September 20th to October 20th.

"Moose are not now very plenty about here [Brownville], but ten years ago they were plenty. I killed two in one August night in Lower Ebeeme pond. They come into the ponds to feed on the lilies. I have seen them in the pond the first of June, with the water half way up their sides, reaching down and taking up the roots of the yellow lily. They come out on very soft bog with no trouble; they drop their body so as partly to swim and partly to wade till they come to shore, then they put their nose on the shore, if it is soft, then raise their forelegs, and then their hind legs one at a time. When swimming undisturbed, I have seen a moose settle down under the water entirely for three or four rods, and then rise and snort and go down again. Whether he did this to get the flies from his ears, or whether it is his habit, I don't know. A young man who hunted moose with me had seen the same thing, and spoke to me of it. When undisturbed they move, on land, slowly and quietly, but when startled, are all alive. Their principal gait when not walking is a trot, while the deer jumps. In the season for the coming together of the sexes, I have seen the male standing on a log, and heard him grunt at intervals; at other times I have heard them low aloud. Sometimes we call them by imitating the low of the male by sounding through a roll of birch bark. The males answer this cry, and come to it; and as they draw near we place the mouth of the trumpet near the water, or, if on land, near the ground, which makes the sound seem farther off, and leads the moose to rush on. When he gets pretty near, it don't do to keep up the deception; then we dip up and pour out water, which brings him right out; or, instead, make a kind of "splash" with the paddle, or any noise that will sound like the stepping of a moose in water. Care should be taken to keep to the leeward of the moose if possible.

"A common way of hunting them is to watch in summer nights at places where they come down for lily-pads, and shoot them there. Another way is to hunt them down in winter when there is a crust."

Regarding the number of young, Anthony (1928:527) makes the following statement:

"The cow Moose has one calf her first season and thereafter two, rarely three. The young are born in late May and remain with the mother until the next spring."

Economic Status:

In pre-colonial times, the flesh of the moose was a staple article of food for the Indians; undoubtedly the skins also were

utilized. Norton (1930:88) recounts Josselyn's statement that the Aborigines considered "dried Moose-tongues" a delicacy. The same writer quotes Champlain's statement that the Indians hunted moose in winter.

As an interesting sidelight, it might be mentioned that a Penobscot Indian once told the present writer that a moose is easier to kill with bow and arrow than a deer. A moose has a tendency, he stated, to lie on the side pierced by the arrow and thus may drive the instrument deeper into its body.

The history of moose protection in Maine is best demonstrated by the following list of open seasons:

No closed season prior to 1830.
1830-1839, open season: September-December, inclusive.
1840-1847, open season: November-June, inclusive.
1848-1852, open season: July-December, inclusive.
1853-1854, open season: October-April 15, inclusive.
1855-1869, open season: October-March 15, inclusive.
1870-1872, open season: October-January, inclusive.
1873-1874, open season: October-December, inclusive.
1875-1879, no closed season.
1880-1895, open season: October-December, inclusive.
1896-1912, open season: October 15-November, inclusive.
1913-1918, open season: November.
1919-1926, no open season.
1927, open season: November 21-26, inclusive.
(In Aroostook, Penobscot, Piscataquis, Somerset, Lincoln, Waldo, Washington, and Hancock Counties.)
1929, open season: November 25-30, inclusive.
(In Aroostook, Penobscot, Hancock, Knox, Lincoln, Waldo, and Washington Counties).
1935, open season: November 28, 29, 30 only.
(In Knox, Lincoln, and Waldo Counties.)

There was no bag limit, either sex, prior to 1889; one bull has been the legal limit since that year.

Archer L. Grover, from whose "Vital Statistics" on Maine game the list of open seasons quoted above was taken, states the following regarding the present number of moose in this State.

"During each winter for the last three years, the wardens have taken a census of deer, moose, and beaver. This census is, without doubt, the most accurate in the case of moose."

He gives the following figures:

1934 2,011
1935 2,083
1936 2,195

If these figures be sufficiently accurate to judge the trend in numbers of moose, and allowing for the legal kill of a total of 48 animals in three counties in 1935, it may be said that moose are slowly increasing in Maine.

Seton (1929, III:174-175) calculates that "under the most favourable circumstances" the annual increase in the number of moose in a herd would not be more than one-fifth. Thus, the moose in a given area might conceivably double their numbers in five years.

It is conservative to state that moose are not existing "under the most favourable circumstances" in Maine at present. But just what the factors are, which keep down the moose population, seems to be a mystery.

Rangifer caribou caribou (Gmelin). Woodland Caribou; Caribou.

General Description:

"A large deer with slightly palmated antlers on both sexes; muzzle hairy; anteorbital facial gland fairly prominent; neck maned on underside; ears short; tail short; tarsal glands but no metatarsal glands; hoofs broad, flat, deeply cleft; accessory hoofs long; upper canines sometimes absent; pelage full, hairs of pith-like structure; young not spotted with white; habitat northern.

"Color.--Sexes colored very much alike, marked seasonal variation may or may not occur.

"General color warm brown, with yellowish white on neck, belly, small patch including the tail and buttocks, and band about each foot; face and legs rather darker brown (autumn pelage).

"In winter the general tone is somewhat lighter (grayish brown, than in summer. Young like adults, with some faint indications of pale spotting.

"Measurements.--Males larger than females. Males, total length, about 72 inches; tail vertebrae, 4 inches; height at shoulder, 42-48 inches; weight from 200-300 pounds. Females, weight, 150-250 pounds." (Anthony, 1928:528-529).

Weight.--"The Woodland Caribou is much heavier than the Barren-ground species; as the bucks weigh from 200 to 300 lbs., the does about a quarter less." (Seton, 1929, III:55).

"This Caribou, which is the original type of the Woodland Caribou group, is a large and powerful animal, about twice the size of a Virginia Deer. A typical specimen, from Maine, in the Zoological Park, New York, is described as 'a strong lusty animal, forty-eight inches high at the shoulders, weighing 280 pounds, and endowed with sufficient energy to vanquish the strongest man in about one minute. . . .'" (Anthony, Mammals of America, 1917:27).

Range in Maine:

The woodland caribou is an animal of the past in Maine.

In colonial times it seems to have ranged over almost the entire State, if not all of it.

With the rise of the lumbering industry and the wholesale slaughter of our larger game, the caribou was unable to withstand the drain on its numbers. By 1860 the number of sizeable herds of caribou in the State was small; accurate reports thereafter, except for the Katahdin area, are mainly of herds numbering a dozen animals or less.

The number of caribou grew steadily smaller. By 1890 the majority of caribou reports came from the Katahdin region, although a few were from elsewhere.

Dutcher (1903:65) stated as follows:

"The caribou is an animal of the past in the Katahdin region. Today all that remains is its bones in the porcupine dens. From accounts received, there have been two migrations of caribou from northern Maine, within the memory of inhabitants now living. The last of these occurred about six years ago.

"Unfortunately the awakening public sentiment in regard to the importance of game preservation did not take place while the animals were still abundant, and their absence now can in part at least be attributed to wanton destruction."

However, the caribou did appear again at Mt. Katahdin; for some were photographed there in 1905. These photographs were published and accompanied an article--"An Early Winter Trip to Katahdin"--which appeared in Appalachia,* Vol. XVI, 1926, pp.493-496.

Lorenz (1917:44) stated that the last caribou seen at Katahdin was seen there in 1908.

A few caribou may have remained in the State as late as 1910, but seemingly reliable reports on them do not date the occurrence of the last animal later than 1908.

* Or Bull. Appalachian Mt. Club, XX, No. 4, 1926.

Of the many reports of the occurrence of caribou in Maine later than this, all should be taken with a grain of salt. The present writer regards Seton's reports (1929, Vol. III, part 1, p.59) as of a very questionable nature. George G. Goodwin's article in the Journal of Mammalogy, Vol. XVII, pp.48-50, contains a good deal of apparently erroneous data. His concluding statement, which is as follows, has not been substantiated by the present writer's delvings into the history of this species within our boundaries:

". . . From the accounts I possess it seems likely that caribou are increasing in numbers in the sparsely-inhabited sections of northern Maine, and the future bears a certain amount of assurance for the perpetuation of the animal in this state."*

There was no closed season on caribou in Maine prior to 1870. From 1870 to 1872, inclusive, the open season was October 1st to January 31st; from 1873 to 1898 the open season was from October 1st to December 31st. There has been no open season since 1898.

There was no bag limit prior to 1893; two animals was the limit from that year until 1895, and one animal during the remaining four years of open season.

That the Maine caribou were not killed, but "strolled away" into New Brunswick (as one writer states), is not very likely. These animals were easy to kill and were shot by hunters, lumbermen, and "sportsmen", who took advantage of their unwariness. That they will ever "stroll" back from New Brunswick is a rather remote hope; there have been no caribou in that section of Canada for six or eight years, at least, according to a recent letter received from Chief Warden H. H. Ritchie of that Province.

The recent questionnaire on big game, circulated to all game wardens in the State by the Wildlife Conservation Department of the University of Maine, yielded no information on the occurrence of Caribou within our boundaries since 1907.

In conclusion it might be pertinent to add that the increase in numbers of deer in Maine probably had no direct effect on the caribou population. As lumbering flourished, the deer found the second growth much to their liking; the less wary caribou did not fare so well at the hand of man, so they were extirpated.

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* Goodwin's statements seem to be partly based on "The Southward Trek," by William J. McNulty, Forest and Stream, 1928, pp.608, 609 and cont. to 638.

Life History and Economic Status:

As this animal is one of the past in this State, its life history and economic status will not be discussed. The reader is referred to Seton, 1929, Vol. 3, part 1, pp.54-94.

Order CETACEA

Order CETACEA (Whales, Dolphins, and Porpoises)

Suborder Mysticeti (Baleen Whales)

Family Balaenidae

Eubalaena glacialis (Bonaterre). Right Whale.

General Description:

"Form massive, Head very large. Rostrum narrow and curved, with a protruberance near the anterior end ("bonnet"). Blowholes elevated and followed by a distinct depression. Lower lip very large, oblong. The free margin more or less sinuous.

"Pectorals very broad, short, with a convex posterior margin and pointed tip.

"Color black throughout, or with more or less white on the throat and breast in some individuals" (True, 1904:298).

"Sexes about equal in size; True gives lengths of American specimens varying from 30 feet to 53 feet" (Anthony, 1928:558).

Range in Maine:

Marine.

In regard to the presence of this species in Maine waters, Mr. Norton (1930:88) says: "with the exception of one which washed ashore on the southern part of Joe's Island, West Southport, in Sheepscot Bay, in the summer of 1919, I have found no definite record of its occurrence in the coastal waters of Maine."

Life History:

See G. M. Allen, 1916.

Economic Status:

Of no importance in Maine owing to its scarcity.

Of the one specimen known from this State Norton (Ibid.) reports that "though an attempt to save the oil and valuable parts was made, the stench of the animal became offensive to neighbors, and it was towed out and cast adrift."

Family Balaenopteridae

Subfamily Balaenopterinae (Finbacks)

Balaenoptera physalus (Linnaeus). Common Finback Whale.

General Description:

"Form remarkably slender, size large. Head narrow and pointed.

"Average total length, 59 feet; maximum 81 or 84 feet (?).

"Pectorals from head of humerus, 12 per cent. of the total length, lanceolate, pointed. Dorsal fin moderate: its height about 2½ per cent. of the total length; more or less falcate; situated just posterior to line of anus.

"Color of the body dark gray above, white below; the two colors merging by imperceptible gradations on the flanks. Coloration on the head not bilaterally symmetrical, there being more white on the right side than on the left, at least as far back as the pectoral; right ramus of mandible white externally, and also the anterior third, or more, of the whalebone; left ramus of the mandible and left whalebone dark gray. Dorsal fin dark gray like the back. Pectorals gray on dorsal surface, white on ventral surface and anterior margin. Flukes dark gray above, white below, with gray posterior margin. Gray of the flanks extending obliquely downward and backward from the pectorals toward the flukes, but not reaching the inferior margin of the caudal peduncle, where there is a narrow white edge, bounded anteriorly by a linear gray mark directed obliquely forward and downward toward the anus." (True, 1904: 300).

Range in Maine:

"Marine, sometimes common off shore" (Allen, 1904:3).

Speaking of the Portland region, Mr. Norton (1930:88) says: "Commonest of the big whales in this section ; usually to be found well off shore in spring, summer and fall."

Life History:

Apparently a gregarious species. Norton (ibid., 89) states that on August 25, 1918: "we encountered a school of upwards of

forty finbacks and two humpbacks, about three miles southeast of Halfway Rock, Casco Bay; when first seen they were spouting, moving slowly to the southward; they were entirely fearless, showing no uneasiness at the approach of the boat, propelled by a gasolene engine. . . ."

See also G. M. Allen, 1916.

Economic Status:

Formerly hunted in Maine waters, but not at the present time. Last hunted during the world war when, according to Mr. Norton, the object was to supply a prospective market for whale meat.

Balaenoptera acutorostrata Lacepede. Little Piked Whale.

General Description:

"Form heavy, size small. Head narrow and pointed. Abdominal ridges numerous and narrow.

"Average total length, 26 feet (?); maximum, 30 feet.

"Pectorals, from axilla, 12.5 per cent. of total length, lanceolate, pointed. Dorsal fin large; its height about 5 per cent. of the total length; situated just in advance of the line of the anus.

"Color of the body dark brownish gray above, white below, the two colors joining rather abruptly on the flanks; inferior margin of caudal peduncle white. Mandible dark gray. Dorsal fin dark like the back. Pectoral fins above with the middle third white, and tip and base dark gray; below similar, but with more white. Flukes gray above, white below. More or less gray mottling on the white abdominal ridges (?)." (True, 1904:301).

Range in Maine:

Marine; apparently occasionally close in shore.

Mr. Norton (1930:92) mentions the 15 ft., 4 in. female recorded by True (1904:193). Another of this species seen by himself on October 24, 1927, just outside of Jacquish Island, Casco Bay, and several other small whales have been seen or killed and may belong to this species.

True (loc. cit.) records "a female, 22 ft. 8 in. long, captured near Quoddy Head Life-saving Station, Maine, Sept. 6, 1889, and reported to the Smithsonian Institution by Capt. A. H. Myers, keeper of the station." Two good photographs of this Quoddy specimen are shown in True's volume - plate 28, figs. 3 and 4.

Life History:

Judging by the literature at hand, it appears to the writer that this species is a good deal like its congeneric relative, the common finback, in behavior; it seems inclined to prefer inshore waters, at least while on the southern part of its range.

Economic Status:

Of no importance.

Sibbaldus musculus (Linnaeus). Blue Whale; Sulphurbottom.

General Description:

"Form massive; size very large. Head very broad and obtuse.

"Average total length, 76 ft.; maximum, 89 feet. Pectorals, from head of humerus, 15 per cent. of the total length, falcate, obtusely pointed. Dorsal fin very small; its height about 1 per cent. of the total length; very variable in form, but usually more or less falcate; situated behind the line of the anus.

"Color of the body mottled gray throughout; the proportion of light and dark tints varying greatly in different individuals; head a little darker and nearly uniform; body usually lightest at the shoulder and between the pectoral and navel; darkest between the navel and anus; some entirely white spots on the posterior ends of the abdominal ridges.

"Pectorals gray on the upper surface except at the tip, usually with some lighter blotches; white on the lower surface, anterior margin, and tip. Dorsal fin dark gray, usually with whitish center crossed by light vertical, curwilinear markings. Flukes gray above and below; the lower surface with fine light and dark gray lines running antero-posteriorly" (True, 1904: 299-300).

Range in Maine:

Of possible occurrence coastwise.

"There seems to be no positive record of the occurrence of this species in the Portland region" (Norton, 1930:93). Mr. Norton then quotes the data for one sight record by Dr. Henry B. Bigelow, from Dr. G. M. Allen's memoir.

Life History:

See G. M. Allen, 1916.

Economic Status:

Of no importance in Maine.

Subfamily Megapterinae (Humpback Whales)

Megaptera nodosa (Bonaterre). Humpback Whale.

General Description:

"Form massive and peculiarly ungraceful, size moderate. Head flat and obtuse. Abdominal ridges few and broad, 14 to 30. Average total length, 48 feet; maximum, 55 feet.

"Pectorals, from head of humerus, 32 per cent. of total length; lanceolate, with extremity recurved; anterior margin with ten or eleven very prominent sinuosities corresponding to the joints of the manus; posterior margin convex proximally, concave distally, with several small sinuosities at the extremity.

"Dorsal low, thick at the base, erect or somewhat falcate, with the anterior margin usually concave near the middle.

"Flukes broad, with convex anterior border, concave posterior border, and acuminate extremities; posterior border crenate.

"Abdominal ridges converging in the median line below, anteriorly, forming an irregular projection below the symphysis of the mandible.

"Inferior outline of the body from the pudendum posteriorly broken by three convexities, of which the largest and most salient is behind the anus. Head and lips with numerous low rounded tuberosities; three rows on the head, one median and two lateral; a large irregular aggregation at the symphysis of the mandible and others scattered along the rami. A semi-elliptical furrow above the base of the pectoral.

"Color black, with white markings. Body black, with a varying number of white areas and markings on the lower surface, especially on the mandible, the abdominal ridges, and about the pudendum. Many of the smaller white markings, especially on the mandible, are in the form of complete or incomplete rings, or circular areas, and are due to barnacles. White markings occasionally on the upper jaw, behind the eye, and on the dorsal fin. Pectorals virtually all white on the upper surface, or with the basal one third to one half clouded with black; a narrow, irregular posterior border and the large upper sinuosities, when occupied by barnacles, black. Under surface entirely white. Flukes black above, with some white markings near the extremities; below, usually with a large white area on each side of the median line, bordered anteriorly and posteriorly with black." (True, 1904:298 and 299).

Range in Maine:

Marine; of frequent occurrence. To be seen from April to November, but probably more frequent in July and August. A migratory species.

Life History:

See G. M. Allen, 1916.

Economic Status:

Of no importance at the present time.

"During the eighties a shore fishery for this whale was conducted in the waters extending eastward from the region of Seguin" (Norton, 1930:97).

Earlier fisheries - at Gouldsborough and elsewhere are described by Earle, 1887, Goode's Fisheries Industries, Sect. II, part 1, pp.5-, 102-.

Suborder Odontoceti (Toothed Cetaceans)

Family Physeteridae (Sperm Whales)

Phypeter catodon Linnaeus. Sperm Whale.

General Description:

"A large, toothed Whale; length reaching 70 to 85 feet for the largest males, females only about a third of this; head huge, deep and square, with large oil-filled reservoir overlying rustrum and cranium; spiracle or blow-hole single, not paired as in the baleen Whales, external opening somewhat S-shaped; dorsal fin absent; pectoral fin broad and short; teeth in lower jaws only, 22 to 24 on each side; throat large, capable of swallowing large masses; color blackish above, lighter below; spout slow and prolonged, diagonally forward in direction; social in habit, congregating in schools of fifteen or more (in times of former abundance in schools of hundreds). . . ." (Anthony, 1928:563-564).

Range in Maine:

For New England - "formerly common off shore" (Allen, 1904: 3).

Mr. Norton states (1930:97-99) that there "seems to be only one definite record of the sperm whale for the vicinity of Portland." This record dates back to John Josselyn and the specimen was washed up between Cape Porpoise and Biddeford Pool, July 17, 1668.

Life History:

A gregarious species of huge size which feeds on squids, octopi, and certain fishes.

Economic Status:

Because of its rarity, never utilized in Maine; formerly hunted extensively elsewhere.

Family Delphinidae (Dolphins, Porpoises, Killers, Grampuses and Blackfish)

Subfamily Delphininae

Delphinus delphis Linnaeus. Dolphin; "Sea Porpoise"; Ring-eyed Porpose.

General Description:

"Body slender; forehead sloping gradually, forming a wide angle with the beak; beak long and slender (average about one fourteenth of the total length); dorsal fin in the middle of the median dorsal line, narrow, and not strongly recurved above, its vertical height about one-ninth the total length; pectoral fins about three times as long as broad, narrow in the distal half, and obtusely pointed.

"Form and disposition of color markings very variable. Back, upper jaw, tail, and fins black or dark gray; under parts white or greenish-white. The black area extends down upon the sides under the dorsal fin in the form of an angular projection (sometimes indistinct), the apex of which is met by the apex of a similar upward projection of the white of the under parts. Sides occupied by two elongated elliptical areas of light color, the anterior and larger of which is fulvous in some individuals and gray in others; the posterior area is gray. A black, gray, or greenish band extends from the lower jaw to the base of the pectoral fin (sometimes absent). Eye surrounded by a ring of black, from which a narrow black band extends forward to the base of the beak. End and margin of lower jaw usually black. One of two longitudinal bands of gray or greenish-gray traverse the light color of the lower part of the sides." (True 1889: 160-161).

True (ibid., 161) gives the following external measurements (in inches) for a male. Length, 89; end of beak to dorsal fin, 39.3; to pectoral fin, 20.0; vertical height of dorsal fin, 9.0; length of pectoral fin, 14; breadth of flukes, 20.5.

Range in Maine:

"This appears to be a pelagic species widely dispersed off both coasts of the North Atlantic." (Norton, 1930:99). Norton (ibid.) mentions one specimen from Portland in the United States National Museum, while G. M. Allen (1904:7) calls the species "pelagic," but does not record it as having occurred in Maine.

Life History:

There is very little information in the available literature on the life history of the dolphins.

Economic Status:

Valuable for oil, but this species is too rare to be of any economic significance in Maine.

Tursiops truncatus (Montague). Bottle-nosed Dolphin; Bottle-nose "Porpoise"; "Porpoise."

General Description:

"General form stout, Forehead sloping; beak short and depressed; lower jaw usually longer than upper jaw. Dorsal fin situated in the middle of the length, high and falcate. Pectoral fins broad at the base, obtusely rounded off at the tip, and not deeply emarginate behind.

"Back, dorsal, pectoral, and caudal fins, snout, and sometimes the tip of the lower jaw and lower lip, clear, plumbeous gray, more or less tinged with purple. The gray color becomes lighter on the sides, and passes by insensible gradations into the pure white of the under surfaces. In some individuals all that portion of the body lying back of the anus is gray; in others the body is bicolor as far as the flukes. (Specimens have occasionally been captured which were entirely of a gray color.)" (True, 1889:158).

True (ibid.) gives the following external measurements (after Flower) (in inches) for an adult male; length, 114; length of mouth, 12.5; tip of snout to dorsal fin, 50; length of pectoral fin, 15.5; vertical height of dorsal fin, 9; breadth of flukes, 24.

Range in Maine:

Coastwise. True (ibid., 159) gives "Atlantic Coast of North America; Maine to Florida," etc., and adds in a footnote, "The commonest species."

Life History:

"This abundant coastal species is probably the Sea Porpoise of the shore fisherman who described it as larger than

the "puffer", dirty black and very active, commonly racing and jumping. It is frequently seen in schools about Eagle Island in Casco Bay," etc. (Horton, 1930:99).

Economic Status:

Probably of no importance in Maine.

The porpoise fishery of the South Atlantic States has been considerable in extent. See the section on blackfish and porpoise fishery by A. Howard Clark in Goode's Fisheries Industries, Sect. V, part 16, pp.295-310.

Lagenorhynchus acutus (Gray.) Striped Dolphin; Skunk Porpoise; Eschricht's Dolphin.

General Description:

"Form stout; greatest girth of the body anterior to the middle of its length. Forehead gradually sloping; beak very short, a mere rim; a depression between it and the forehead on either side of the head; dorsal fin high and recurved, and attenuated in the distal half. Pectoral fins broad at the base, pointed. Flukes large; caudal ridges very strongly developed.

"Upper jaw, forehead, back, and fins black; sides of head and body gray. On the upper part of the sides of the tail the gray color passes into dusky yellowish; lower down on the sides, below the dorsal fin, an oblong area of white. A narrow black band extends along the sides from the base of the flukes to about the line of the dorsal fin. (? sometimes absent); another line of black extends from the base of the pectoral fins to a point between the eye and the corner of the mouth; the eye is surrounded by a circle of black, from which a line extends forward to the beak; the vent is in a small black area. The base of the flukes inferiorly and the adjacent margin of the tail are whitish. The margin of the lower jaw is sometimes black." (True, 1889:169).

True (ibid.) gives the following measurements, in inches, (after Duguid). Total length (along the back), 99; extremity of snout to pectoral fin, 16; to dorsal fin, 37; vertical depth of dorsal fin, 13; length of pectoral fins, 13; breadth of flukes, 25.

Range in Maine:

Probably of occasional occurrence coastwise. Horton (1930: 100) gives one record for the vicinity of Portland, which dates back to the 1870's.

This is a North Atlantic species which has not been recorded south of Cape Cod, and at that locality only once.

Life History:

I find nothing pertaining to the life history of this species in the available literature.

Economic Status:

Through scarcity the economic importance of this species is not considerable, but the oil is of commercial value as porpoise oil.

Orcinus orca (Linnaeus). Atlantic Killer; Killer Whale; Killer.

General Description:

"Size very large, head broad, conical, and depressed. Dorsal fin erect, extraordinarily high in the male. Pectoral fins short and broad.

"Upper half of head, back, and fins black. Lower jaw, breast, and belly whitish. The white area forms a trident posteriorly, the central tine of which extends back to the vent, while the lateral tines extend obliquely upward and backward on the sides. A large white blotch behind the eye. A crescent-shaped area of purple extends across the median line of the back behind the dorsal fin (? sometimes obsolete)." (True, 1887:187).

"Total length 20 feet or more. . . ." (Anthony, 1928:568).

Range in Maine:

Common offshore; and, according to Norton (1930:101), occasionally it strays inshore.

"Me.--Eastport." (G. M. Allen, 1904:5).

Life History:

Nelson(1918:488) has the following to say about this species:

"The killer usually travels and hunts in "schools" or packs of from three to a dozen or more individuals. Unlike most whales, the members of these schools do not travel in a straggling party, but swim side by side, their movements as regularly timed as those of soldiers. A regularly spaced row of advancing long black fins swiftly cutting the undulating surface of the sea produces a singularly sinister effect. The evil impression is well justified, since killers are the most savage and remorseless of whales. The jaws are armed with rows of effective teeth, with which the animals attack and devour seals and porpoises, and even destroy some of the larger whales."

"Killers are known to swallow small seals and porpoises entire and attack large whales by tearing away their fleshy lips and tongues."

Economic Status:

None in Maine.

Grampus griseus (Cuvier). Grampus; Gray Grampus; Cowfish.

General Description:

"General form somewhat similar to that of Globicephalus. Head globose, with a slight indication of a beak; mouth oblique; lower jaw shorter than the upper. Dorsal fin high and falcate; pectoral fins falcate, elongated. Flukes narrow antero-posteriorly.

"Back, dorsal fin and flukes dark gray or blackish, more or less tinged with purple. Pectoral fins blackish and mottled with gray. Head and anterior half of body light gray, varied in hue and tinged with yellow. Belly grayish white. Body marked with numerous and conspicuous light-colored, irregular, and unsymmetrically-placed striae.

"Young.--Dark gray above, grayish white below. Head whitish, strongly tinged with yellow. Side with five or more narrow, vertical, and nearly equidistant lines." (True, 1887: 182-193).

True (ibid., 183) gives the following measurements in inches for an adult female. "Total length, 136; length of mouth, 10½; tip of snout to anterior base of dorsal fin, 47; length of pectoral fin, 23-75; vertical height of dorsal fin, 1c; breadth of flukes, 29."

Range in Maine:

In regard to this species in the Portland region, Mr. Norton (1930:101) has the following to say:

"The gramous is frecuently mentioned as being seen by boatmen along our shores but we know of no definite records of authentic specimens of this species from the region. . . ."

"The name* as used by the fisherman appears to be one applying rather generally to any small cetacean not identified as a killer, a blackfish, a dolphin or a porpoise." (ibid, 102).

Dr. G. M. Allen (1904:6) records this species for Massachusetts, but not for Maine.

Life History:

There is a dearth of information on the life history of this species in the available literature.

Economic Status:

Of no importance at the present time in Maine.

The oil of this species is valuable and probably not distinguished from porpoise or blackfish oil.

Globicephala malaena (Traill). Blackfish.

General Description:

"Size large; form stout. Head globose; forehead protruberant, overhanging the lip in adult individuals; body especially deep opposite the dorsal fin. Pectoral fins very long, slender, and pointed; length about one-fifth the total length of the body. Dorsal fin on a long base and strongly recumbent, situated anterior to the middle of the length of the body. Caudal ridges prominent, extending respectively to the dorsal fin and to the vent. Flukes large and broad. Mouth oblique.

"General color uniform black; a large hastate white area on the breast extending from the line of the corners of the mouth to the base of the pectoral fins; from behind this area a white band, which is much the broadest in the posterior half,

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* "Grampus"

extends backwards along the median line to the vent; the whole white area has the general form of an arrow with its head, shaft, and feathers." (True, 1889:183,184).

True (ibid.,184) gives the following measurements, in inches, from Bell. Length, 182; extremity of snout to corner of mouth, 14.5; to dorsal fin, 55; length of pectoral fin along anterior edge, 50; greatest breadth of pectoral fin, 11.

Anthony (1928:570) gives the "total length about 15 to 19 feet. . . ."

Range in Maine:

Of frequent occurrence all along the coast, mainly in fall and winter, in varying numbers.

Life History:

The blackfish is a very gregarious species for, according to A. Howard Clark (in Goode's Fishery and Fisheries Industries, Sec. V, Vol. II, p.297), "in the year 1874 it is estimated that three thousand blackfish were stranded on the sandy shores of Cape Cod, and smaller schools have frequently been driven ashore at that Cape and other places in New England. . . ."

Clark goes on to describe (ibid., 298) a school of blackfish which went ashore at Dennis, Mass. in August, 1874. "The blackfish varied in length from 6 to 20 feet, many of them being cows with sucking calves. A gash in the breast of one of the cows allowed a stream of rich, white milk, 2 or 3 gallons at least, to gush out. One of the pregnant females, not exceeding 12 feet in length, was dissected, and specimens of young blackfish of various sizes obtained from it, the largest at least 6 feet long. These unborn calves were bluish instead of black in color on the back, and grayish-white beneath. In every instance they were marked by a spiral line of lighter color, which wound about the body five or six times, and which were supposed to have been caused by pressure of the placental envelope. The old males were the largest, and could be distinguished by the prominent humo between and over the eyes."

Mr. Norton (1930:102) refers to Wheeler's History of Brunswick (1878), wherein is recounted the capture of seventy or eighty blackfish in a cove at Orr's Island, Casco Bay, about the first week in October, 1828.

Clark (1887:304) tells of a school of blackfish which were driven into Shipyard Cove, Friendship, Maine in 1874. "There

were one hundred and eighty-one fish slaughtered, the largest 19 feet long, and probably weighing 2 tons; the smallest at least 10 feet; probable average length, 15 feet. It is estimated that they will make 150 barrels of oil, the blubber filling the decks of three large schooners."

Economic Status:

The blackfish is valuable for its oil, but the species is not deliberately hunted nowadays. They are said to be easily driven ashore or into shallow water where they can be killed, so the occurrence of a school of these "fish" might cause them to accuire an economic status at any time.

Phocaena phocaena (Linnaeus). Harbor Porpoise; Puffing Pig; Puffer; Herring Hog.

General Description:

"Head sloping; jaws equal in length; mouth longer than one half the pectoral fin.

"Body fusiform, slender. Dorsal fin beginning somewhat in front of the middle of the length, triangular; its anterior margin nearly straight; its posterior margin concave; its vertical height equal to or less than the length of the mouth; the anterior margin sometimes with a row of small tubercles. Pectoral fins nearly ovate, obtusely pointed. Flukes broad antero-posteriorly.

"Head, back, dorsal, pectoral, and caudal fins, and (usually) the margin of the lower jaw dark slate-color or blackish. Sides lighter, the dark color fading gradually and irregularly into the white belly. Sides sometimes tinged with pink or yellowish. The dark color of the margin of the lover jaw often extends backward as an irregular broad band reaching half way to the pectoral. A narrow dark line also extends from the corner of the mouth to the anterior base of the pectoral fin." (True, 1889:179).

Anthony (1928:570) refers to this genus as follows: "Color above slaty black, below lighter (females white below); color never in spots."

True (ibid., 180) gives the following measurements, in inches, for an adult female. Length, 68; length of mouth, 4.75; tip of snout to dorsal fin, 29; length of pectoral fin, 7; vertical height of dorsal fin, 4; breadth of flukes, 12.5.

Range in Maine.

"This is the common porpoise found all along our shores, and within our bays. . . ." (Norton, 1930:103).

Life History:

"It may be seen in pairs or small groups, going with the tide, or playing in the eddies, puffing leisurely; it usually blows three or four times and sounds for a short period. Under water it moves with great rapidity. A very young porpoise of this species was found dead in one of the docks of Portland Harbor about the middle of May, 1912. It was about 39½ inches long." (Norton, loc. cit.).

The present writer has observed this species frequently in the New Meadows River, between New Meadows Landing and Gurnet This species seems very unwary and not at all particular about keeping away from shore or in deep water. In order for porpoises to get into the stretch of water mentioned, they are obliged to pass under the bridge at Gurnet, in a narrow passage where the tide pulls with considerable velocity and the "shore" is but a few feet away.

Economic Status:

None, unless it may be said that they are an added attraction to our shores in the summer season.

It is said to recuire five or six porpoises to produce one barrel of oil, hence these cetaceans have never been extensively pursued for their oil, to my knowledge, in Maine.

I am informed that harbor porpoises may be hunted, to some extent, for food and oil by the Passamaquoddy Indians.

Subfamily Delphinapterinae

Delphinapterus leucas (Pallas). White Whale; Beluga.

General Description:

"Size moderate. Head globose, not prolonged into a snout. Neck marked by a slight constriction. No dorsal fin, the center of the back rising instead into a low, irregular ridge. Pectoral fins short, very broad across the center, and obtusely pointed.

"Color white throughout." (True, 1887:187).

"Total length, 137.5 inches; tip of snout to pectoral fin, 29 inches; length of pectoral fin, 16.5 inches; greatest breadth of pectoral fin, 10.5 inches." (Ibid., 188).

Range in Maine:

For the Portland region:

"An occasional visitant from northern waters. . . ." (Norton, 1930:103).

Probably also occasional on other parts of the Maine coast.

"Me.--Black-point Harbor." (G. M. Allen, 1904:5).

This arctic and sub-arctic species has been known to straggle as far south as the coast of New Jersey.

Life History:

In regard to six white whales seen by Mr. Jed F. Fanning in 1927, off Peabble's Point, Cape Elizabeth, Norton (ibid., 104) has the following to say:

"... He noticed carefully their uniform creamy white coloring, their size, and the absence of a dorsal fin. Their habit of blowing simultaneously was a striking one, which made a certain count of their numbers possible. They were usually all seen together, though on one or two occasions but three were seen, and on August 28, eight were reported in Portland Harbor by one of the papers."

Nelson (1918:468) writes of the white whale as follows:

"The white whale is said at times to attain a length of 20 feet, but its ordinary length is nearer 10 or 12 feet. It travels in irregular "schools" of from three to ten or fifteen individuals and usually rolls high out of water when it comes up to breathe. It enters sheltered bays and the lower courses of streams, mainly at night, in pursuit of fish, which furnish its main food supply. During the twilight hours of the Arctic summer night, glowing with beautiful colors, the ghostly white forms of these whales breaking the smooth blue-black surface of a far northern bay add the crowning effect of a strange unworldly mystery to the scene."

Economic Status:

Of no importance in Maine.

Family Ziphiidae (Beaked Whales)

Hyperoodon ampullatus (Forster). Bottlenose Whale.

General Description:

A medium-sized whale, having a decided "beak." Dorsal fin present, but small and triangular, and situated considerably nearer the flukes than the head.

"Teeth confined to a single pair, hidden in the gum at the end of the lower jaw; beak well developed. Color above, varying from black to light brown, sometimes almost yellow, with whitish about the head; below grayish white. Total length, about 24 feet for females, 30 feet for males." (Anthony, 1928:574).

Range in Maine:

Known to have occurred once, at Wells Beach, March 2, 1906. (See Norton, 1930:105).

Life History:

Very little is known about the life history of this species.

Economic Status:

Too rare over all its known range to be of importance anywhere.

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American Naturalist, I, 652-666.

Very interesting notes on the larger Maine mammals; observations dating about the time of the Civil War.

Clark, Alonzo Howard

1887. "The Blackfish and Porpoise Fishery."
Sec. V, Vol. II, part XVI, pp.297-310 of:
The Fisheries and Fishery Industries of the United States Prepared through the Co-operation of the Commissioner of Fisheries and the Superintendent of the Tenth Census.
Section V: History and Methods of the Fisheries in two volumes, with an Atlas of Two Hundred and Fifty-five Plates.
Washington, Gov't. Printing Off. Xx plus 881 pp.

Includes a brief account of the taking of a school of blackfish at Friendship, Maine, in December, 1874.

Copeland, Manton and Pope, Alton S.

1917. "Notes on Maine Mammals."
Proc. Biol. Soc. Wash., XXX, 159-160.

Important data regarding the capture of specimens of Synaptomys, Neosorex, and Microsorex at various localities.

Coues, Elliot

1877. Fur-bearing Animals: A Monograph of the North American Mustelidae, in which an account of the wolverene, the martins or sables, the ermine, the mink and various other kinds of weasels, several species of skunks, the badger, the land and sea otter and numerous exotic allies of these animals, is contributed to the History of North American Mammals.
Dept. of the Interior, U. S. Geol. Surv. of the Terr., Misc. Pub. No. 8, Xiv plus 348 pp., 20 pls.

An old but very important work on this group of fur-bearers.

Cram, William Everett

1904. See Stone and Cram.

1924. "The Red Squirrel."
Journal of Mammalogy, V. 37-41, drawings.

Data on food habits of this rodent in New Hampshire (?).

Davis, David E.

1936. "Status of Microtus Enixus and Microtus Terraenovae."
Journal of Mammalogy, XVI, 290-291.

Microtus pennsylvanicus fontigenus, which eventually may be found in Maine, is thought possibly to be inseparable from M. p. pennsylvanicus.

Dice, Lee R.

1927. "The Transfer of Game and Fur-bearing Mammals from State to State, with especial Reference to the Cottontail Rabbit."
Journal of Mammalogy, VIII, 90-96.

Nothing is said about Maine in this article, but it mentions the fact that western cottontails are

being shipped into Connecticut for restocking purposes. If these "outlanders" spread and breed with the depleted native stock, what race of Sylvilagus may we eventually find in Maine? In this connection it might also be worth remembering that the Maine snowshoe hares are being shipped to New York state and probably elsewhere for restocking purposes.

Dutcher, B. H.

1903. "Mammals of Moutn Katahdin, Maine." Proc. Biol. Soc. Wash., XVI, 63-71.

An important paper about an area that has had too little attention from mammalogists. Dutcher was at Katahdin in the summer of 1902, about the time of the last of the Maine Caribou.

Elliot, Daniel Giraud

1901. A Synopsis of the Mammals of North America and the Adjacent Seas. Field Columbian Museum, Zool. Ser., II, xiv + 471 pp., xlix pls.

This is a valuable work, for the illustrations consist of good photographs of representative skulls of all the important North American genera.

Goodwin, George G.

1936. "Big Game Animals in the Northeastern United States." Journal of Mammalogy, XVII, 48-50.

Moose, deer, caribou, cougar, and wolf in Maine. Some of the data is apparently compiled from unreliable sources; for example, Goodwin's data on the occurrence of caribou in Maine in recent years is undoubtedly incorrect.

Hamilton, William J., Jr.

1929. "Breeding Habits of the Short-tailed Shrew, Blarina Brevicauda." Journal of Mammalogy, X, 125-134, ills.

Much of importance on this species in New York State.

Hamilton, William J., Jr. (Continued)

1930. "The Food of the Soricidae."
Journal of Mammalogy, XI, 26-39, diagrams.

An important article on the food of shrews in New York State.

1931. "Habits of the Star-nosed Mole, Condylura Cristata."
Journal of Mammalogy, XII, 345-355, ills.

In New York State.

1935. "Notes on the Food of Red Foxes in New York and New England."
Journal of Mammalogy, XVI, 16-21.

Data for New York and Massachusetts, but probably applicable to a large extent to Maine.

1936. "Seasonal Food of Skunks in New York."
Journal of Mammalogy, XVII, 240-246.

A very important paper and the data is probably applicable to Maine.

Hisaw, Frederick W.

1923. "Feeding Habits of Moles."
Journal of Mammalogy, IV, 9-20.

Although this paper deals with material in Kansas, it is of much general interest.

Hollister, Ned

1913. "A Synopsis of American Minks."
Proc. U. S. Nat. Mus., XLIV, 471-480.

Howe, Reginald Herber, Jr.

1901. "A New Race of Microtus Pennsylvanicus."
Proc. Portland Soc. Nat. Hist., II, part 3. p.20, 1 pl.

Original description of Microtus pennsylvanicus shattucki, from Tumble Down Dick Island, near Long Island, Penobscot Bay. The validity of this form is now doubtful. (See Wyman, 1922.)

Howell, A. Brazier

1926. Voles of the Genus Phenacomys.
North American Fauna, No. 48. Washington, Gov't. Printing Off. iv + 66 pp., 7 pls., maps.

Suggests (on page 3) that this genus may eventually be taken in the "New England States."

1927. Revision of the American Lemming Mice (Genus Synaptomys).
North American Fauna, No. 50, 37 pp., 2 pls. Washington, Gov't. Printing Off.

Howell, Arthur Holmes

1901. Revision of the Skunks of the Genus Chincha (Mephitis).
North American Fauna, No. 20. Washington, Gov't. Printing Off. 45 pp., 8 pls.

1915. Revision of the American Marmots.
North American Fauna, No. 37, Washington, Gov't. Printing Off. 80 pp., 15 pls., maps.

1929. Revision of the American Chipmunks (Genera Tamias and Eutamias).
North American Fauna, No. 52. Washington, Gov't. Printing Off. 157 pp., 10 pls., text figs.

Jackson, C. F.

1922. "Notes on New Hampshire Mammals."
Journal of Mammalogy, III, 13-15.

Mentions for Maine: panther and caribou.

Jackson, Hartley H. T.

1925. "The Sorex Arcticus and Sorex Arcticus Cinereus of Kerr."
Journal of Mammalogy, VI, 55-56.

Shows that Sorex personatus becomes S. cinereus, with corresponding changes in the subspecies.

1926. "An unrecognized Water Shrew from Wisconsin."
Journal of Mammalogy, VII, 57-58.

"The water shrews and marsh shrews have in recent years been placed in the genus Neosorex, the water

Jackson, Hartley H. T. (Continued)

shrews in the subgenus Neosorex and the marsh shrews in the subgenus Atophyrax. A detailed study of all available material of these two groups for the United States Biological Survey makes it necessary to include both in the genus Sorex, the water shrews in the subgenus Neosorex and the marsh shrews in the subgenus Atophyrax . . . ."

1928. A Taxonomic Review of the American Long-tailed Shrews (Genera Sorex and Neosorex).
North American Fauna, No. 51, 238 pp., 13 pls., text figs. Washington, Gov't. Printing Off.

Johnson, Beatrice W.

1927. "Preliminary Experimental Studies of Mice of Mount Desert Island, Maine."
Journal of Mammalogy, VIII, 278-284.

An ecological study.

Johnson, Charles Eugene

1925a. "The Jack and Snowshoe Rabbits as Swimmers."
Journal of Mammalogy, VI, 245-249.

On page 246 are observations by William Brewster at Lake Umbagog, Maine.

1925b. The Muskrat in New York; Its Natural History and Economics.
Roosevelt Wild Life Bulletin, III, No. 3. 194-320 pp., ills.

A very complete and valuable study of this important fur-bearer.

Klugh, A. Brooker

1921. "Notes on the Habits of Blarina Brevicauda."
Journal of Mammalogy, II, 35.

At Lake Missanag, Ontario, in August and September.

1927. "Ecology of the Red Squirrel."
Journal of Mammalogy, VIII, 1-32, 5 pls.

Komarek, E. V.

1932. "Distribution of Microtus Chrotorrhinus, with Description of a New Subspecies."
Journal of Mammalogy, XIII, 155-158., map.

Maine mentioned as part of the range of this mouse.

Lantz, David E.

1910. Raising Deer and Other Large Game Animals in the United States.
U. S. Biological Survey, Bull. No. 36. 62 pp., 8 pls.

1914. Economic Value of North American Skunks.
U. S. Dept. of Agriculture, Farmers' Bull., No. 587.

1917. The muskrat as a fur bearer; with notes on its use as food.
Contribution from the Bureau of Biological Survey, 23 pp., ills.

Lorenz, Annie

1917. "Notes on the Hepaticae of Mt. Ktaadn."
Bryologist, XX, 41-46.

On page 44 is a statement regarding the caribou on Mount Katahdin; the last of these animals on the mountain is said to have been seen there in 1908.

Manlif, Lelyn Branin

1936. "The Beginning of Hibernation of Jumping Mice on Mount Desert Island."
Bull. New Eng. Mus. Nat. Hist. (formerly Boston Soc. Nat. Hist.), No. 80, 5-6.

Merriam, C. Hart, and Miller, Gerrit S., Jr.

1895. Revision of the Shrews of the American Genera Blarina and Notiosorex. By C. Hart Merriam. The Long-tailed Shrews of the Eastern United States. By Gerrit S. Miller, Jr. Synopsis of the American Shrews of the Genus Sorex. By C. Hart Merriam.
North American Fauna, No. 10, 125 pp., 13 pls., text figs. Washington, Gov't. Printing Off.

1896. Synopsis of the Weasels of North America.
North American Fauna, No. 11. 45 pp., 5 pls., text figs. Washington, Gov't. Printing Off.

Merriam, C. Hart, and Miller, Gerrit S., Jr. (Continued)

*1900. "Preliminary Revision of the North American Red Foxes."
Proc. Wash. Acad. Sci., II, 661-676.

Miller, Gerrit S., Jr.

1895. See Merriam and Miller.

1896. Genera and Subgenera of Voles and Lemmings.
North American Fauna, No. 12. 85 pp., 3 pls.
Washington, Gov't. Printing Off.

1897. Revision of the North American Bats of the Family Vespertilionidae.
North American Fauna, No. 13. 141 pp., 3 pls., text figs. Washington, Gov't. Printing Off.

1900. Key to the Land Mammals of Northeastern North America.
Bull. N. Y. State Museum, VIII, No. 38. 61-130 pp.

1907. The Families and Genera of Bats.
U. S. Nat. Mus., Bull. No. 57. xvii + 282 pp., ills., 14 pls.

1924. List of North American Recent Mammals, 1923.
U. S. Nat. Mus., Bull. No. 128. xvi + 673 pp.

1928. The American Bats of the Genera Myotis and Pizonyx.
U. S. Nat. Mus. Bull. No. 144. viii + 213 pp., ills., map.

Nelson, Edward W.

1909. The Rabbits of North America.
North American Fauna, No. 29. 314 pp., 13 pls., text figs. Washington, Gov't. Printing Off.

Mentions the Cottontail in extreme southwestern Maine (p.196).

1916. "The Larger North American Mammals."
National Geographic Magazine, XXX, No. 5, pp.385-472., colored plates by Fuertes, drawings of tracks by Seton, and photographs.

1918. "Smaller Mammals of North America."
National Geographic Magazine, XXXIII, No. 5, pp. 371-493., colored plates by Fuertes, drawings of tracks by Seton, and photographs.

Norton, Arthur H.

1930. Mammals of Portland, Maine, and Vicinity. Proc. Portland Soc. Nat. Hist., IV, part 1, pp. 1-151, map.

Osgood, Wilfred Hudson

1909. Revision of the Mice of the American Genus Peromyscus. North American Fauna, No. 28. 285 pp., 8 pls., maps. Washington, Gov't. Printing Off.

Now rather outdated.

Phillips, John Charles

1920. "Skull Measurements in Northern Virginia Deer." Journal of Mammalogy, I, 130-133.

A series of measurements, of a selected series of 96 adult male O. v. borealis, subjected to biometric analysis. The most reliable skull measurement is the "palatal length," which shows a coefficient of variability of only 4.318.

Pope, Alton S.

1917. See Copeland and Pope.

1922. "Mammals of Brunswick and Vicinity." Maine Naturalist, II, 21-25, 61-65.

Preble, Edward A.

1899. Revision of the Jumping Mice of the Genus Zapus. North American Fauna, No. 15. 43 pp., 1 pl., text figs. Washington, Gov't. Printing Off.

Preble, Norman A.

1936. "Notes on New Hampshire Chipmunks." Journal of Mammalogy, XVI, 288-289.

Food, hibernation, etc.

Scheffer, Theodore H.

1922. American Moles as Agricultural Pests and as Fur Producers. U. S. Dept. of Agriculture, Farmers' Bull., No. 1247. 23 pp., ills.

Seton, Ernest Thompson

1909. Life Histories of Northern Animals; an account of the mammals of Manitoba.
Charles Scribner's Sons, N. Y. 2 vols. xx + 1267 pp., 68 maps, 560 drawings.

1920. "Notes on the Breeding Habits of Captive Deermice."
Journal of Mammalogy, I, 134-138. ills.

At CosCob, Conn.

1921. "The Sea Mink, Mustela Macrodon (Prentiss)."
Journal of Mammalogy, II, 168.

Suggests the possibility of more mounted specimens of this extenct species being found in Maine.

1928. Lives of Game Animals: an account of those land animals in America, north of the Mexican border, which are considered "game", either because they have held the attention of sportsmen, or received the protection of law.
Doubleday Page and Co., Garden City, Ny., 1925-1928. 4 volumes (in two parts each), xxxix + 3113 pp., 50 maps, 1500 drawings.

Sheldon, Carolyn

1930. "Nova Scotia Red-backed Mice---Clethrionomys Gapperi Ochraceus."
Journal of Mammalogy, XI, 318-320.

1934. "Studies in the Life Histories of Zapus and Napaeozapus in Nova Scotia."
Journal of Mammalogy, XV, 290-300.

Shull, A. F.

1907. "Habits of the Short-tailed Shrew, Blarina Brevicauda (Say)."
American Naturalist, XLI, 495-522, ills.

Simpson, Sutherland Eric

1923. "The Nest and Young of the Star-nosed Mole (Condylura Cristata)."
Journal of Mammalogy, IV, 167-171., ills.

At Ithaca, New York. Not many nests of this species have been described.

Snyder, L. L.

1921. "An outside Nest of the Flying Squirrel." Journal of Mammalogy, II, 171.

At Point Pelee, Ontario. The eastern flying squirrel apparently does not make an outside nest very frequently and this is one of the few recorded instances.

1924. "Some Details of the Life History and Behavior of Napaeozapus Insignis Abietorum (Preble)." Journal of Mammalogy, V, 233-237.

Description of an Ontario nest of this species.

Soper, J. Dewey

1921. "Notes on the Snowshoe Rabbit." Journal of Mammalogy, II, 101-108.

In Alberta and Ontario; behavior, numbers, food, etc.

Stegeman, LeRoy C.

1930. "Notes on Synaptomys Cooperi Cooperi in Washtenaw County, Michigan." Journal of Mammalogy, XI, 460-466. diagrams.

Young, food, etc.

Stone, Witmer, and Cram, William Everett

1904. American Animals. A Popular Guide to the Mammals of North America North of Mexico, with Intimate Biographies of the More Familiar Species. Doubleday, Page and Co., Garden City, N. Y. xxiii + 318 pp., col. pls. and many photographs. Second edition.

Probably the best popular book on mammals at the time of its publication and still among the leaders. Well illustrated.

Struthers, Parke H.

1928. "Breeding Habits of the Canadian Porcupine (Erethizon Dorsatum)." Journal of Mammalogy, IX, 300-308., 2 pls.

At Nelson, New Hampshire. Much of value on this animal.

Thoreau, Henry David

1864. The Maine Woods.
Boston, Mass. Ticknon and Fields. 328 pp.
(Consists of three papers. The first of which ("Ktaadn") was published in the Union Magazine, New York, in 1848, the second ("Chesuncook") in the Atlantic Monthly in 1858; the last ("the Allegash and east branch") is here first printed.

This book has a number of random references to wolves and other animals; it gives an excellent picture of the Maine woods in the 1840's.

True, Frederick William

1889. Contributions to the Natural History of the Cetaceans. A Review of the Family Delphinidae.
U. S. Nat. Mus., Bull. 36. 191 pp., 47 pls.

Of the few works on this family written in English, this is perhaps the best.

1904. The Whalebone Whales of the Western North Atlantic Compared with those occurring in European Waters, with Some Observations on the Species of the North Pacific. Smithsonian Contr. to Knowledge, XXXIII, 332 pp., 50 pls., 96 figs.

Measurements, etc., but not much on habits and occurrence, for which see G. M. Allen, 1916.

Wyman, Leland C.

1922. "The Validity of the Penobscot Field Mouse."
Journal of Mammalogy, III, 162-166.

The author shows that the measurements for M. p. shattucki are within the range of those for M. p. pennsylvanicus, etc.

1923a. "Microtus Chrotorrhinus in Maine."
Journal of Mammalogy, IV, 125-126.

Records the capture of the only known specimens from Maine---three taken at Mouth Coburn, Somerset County.

1923b. "A Hungry Porcupine."
Journal of Mammalogy, IV, 190.

A porcupine at Mount Coburn, Somerset County, Maine, gnawed the steering wheel of an automobile almost completely off. Also mentions Peromyscus and (?) Synaptomys at the same locality.

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References to the extended accounts are underlined, while references to the keys, etc. are not underlined.

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